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**Patient Safety Forum 2019**

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# Conference Proceedings

Kingdom of Saudi Arabia,  
Ministry of National Guard Health Affairs

**[patientsafetyforum.org](http://patientsafetyforum.org)**



**BMJ**



# Message from the CEO

A warm welcome to the 2019 Annual Patient Safety Forum.

In its ninth year, the forum is taking its quality and safety improvement journey to a new level and a new destination, the Western Region of Saudi Arabia.

In addition to the robust scientific program and the interactive educational experiences, the quality improvement researches, projects and stories are a remarkable source of learning.

It is truly inspiring to witness the large numbers of abstracts highlighting different aspects from patient safety research and improvement initiatives. This is a clear indication of the passion and enthusiasm among healthcare workers to improve quality and patient safety across the nation.

This is coupled with a rigorous peer-review process to ensure consistent evaluation and inclusion of high-quality projects.

On behalf of the MNG-HA staff and the teams who worked diligently to make the Forum a great success, I would like to thank all of the abstracts authors and welcome all participants and attendees and wish you all a productive and an inspiring experience.



**Bandar Al Knawy, MD, FRCPC Chief Executive Officer, Ministry of National Guard -Health Affairs President, King Saud bin Abdulaziz University for Health Sciences President, Patient Safety Forum 2019**

# Message from the Chairman of the Scientific Committee

In recent years, Healthcare industry has been undergoing major transformation and concepts revolving around quality, safety and value-based care are becoming the core of discussion in most scientific platforms.

At a regional level, MNGHA and KSAU-HS started preaching for healthcare quality & safety and patient empowerment via the swiftly growing Patient Safety Forum that soon became the most regionally prominent platform and internationally recognized scientific forum addressing quality and patient safety.

A robust program comprising significant keynotes, plenary sessions and well-structured workshops have been quite appealing to attract local, regional and international experts and healthcare providers.

This year where the 9th Patient Safety Forum is being hosted in Jeddah, I would like to extend my gratitude to the leadership of MNGHA & KSAUHS for the tireless support for this important forum to successfully continue serving its purpose.

Thanks and appreciation to Scientific and Organizing Committee members for their great efforts in orchestrating such a wonderful program

My warm and heartfelt welcome to all speakers, participants and attendees.



**Dr. Mohammed Alzahrani**  
**Executive Director, Medical Services-WR**  
**Chair, Scientific Committee**  
**Ministry of National Guard Health Affairs**

# Welcome

The Patient Safety Forum (PSF) 2019 is aimed primarily at healthcare professionals and stakeholders with expertise in quality care, and is intended to promote research and education in improving healthcare services and patient safety. National and international professionals will share their inspirational expertise to reach optimal healthcare quality and patient safety. A total of 112 abstracts will be presented as poster or oral presentations and will embrace 7 different themes that are central to patient safety. These themes include the role of innovation and technology in improving patient safety, safe patient journey, learning from other industries, medication safety, environmental safety, infection prevention, and integrating patient safety in medical education; all incorporated in one event.

All thanks to the abstract review committee team and the organizers for their boundless cooperation and harmonized teamwork.

**The 9<sup>th</sup> annual PSF meeting always provides an exceptional opportunity for inter-professional collaboration and networking. We look forward to a delightful forum!**

# Scientific Committee

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# Outcomes of tracheostomy patients using an interdisciplinary care model (retrospective cohort)

**Hashem Alhashemi, Dr Mohammed Algarni, Dr Hadi Hakami, Narvanie Seebran CRN, Mazen Alayed (Speech Clinician), Dr Tarik Hashem, Dr Tanvir Hussain, Abdulla Tashkandi (Respiratory Therapist)**

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## Background

There are no national data regarding outcomes of tracheostomy patients. The aim of this study was to examine the outcomes of tracheostomy inpatients at KAMC-Jeddah using an interdisciplinary care model. The objectives were to identify the proportion of tracheostomy patients with successful decannulation, estimate the time to decannulation post intensive care unit (ICU) discharge, and to identify the predictors of weaning trials failure.

## Methods

This study had a retrospective cohort design in which all tracheostomy patients from January 2016 until December 2018 were included. Pediatric patients and those with neck tumors obstructing the airway were excluded. Data regarding patients' demographics, comorbidities, GCS, and ICU discharge and decannulation dates were collected. Tracheostomy patients were assessed weekly during team rounds by all team members (respiratory therapist, speech clinician, ENT doctor, rehab medicine doctor, tracheostomy resource nurse).

## Results

The cohort included 221 patients, of whom 36 were chronic tracheostomy patients. Of the 185 patients who underwent weaning trials, 71 (38%) were successfully weaned and decannulated; the median time to decannulation post ICU discharge was 46.5 days. Predictors of weaning trials failure were number of comorbidities (odd ratio [OR] 2.635, 95% CI 1.4-5.0,  $p < 0.01$ ), GCS score  $< 11$  (OR 6, 95% CI 2.7-13.9,  $p < 0.01$ ), female sex (OR 3.1, 95% CI 1.3-7.5,  $p < 0.01$ ), and age (OR 1.04, 95% CI 1.02-1.06,  $p < 0.01$ ). All decannulation attempts were safe and successful, and none of the 40 inpatient deaths (18%) were related to tracheostomy.

## Conclusion

The majority of tracheostomy patients had prolonged hospital stay. The interdisciplinary care model ensured the safety of their weaning/decannulation process and improved the quality of their hospital care.

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# Royal Commission Health Services Program HACKATHON 2018: patient safety digitalized

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## Background

Ensuring that patients have safe and smooth experiences in healthcare is getting more and more difficult with the complexity of healthcare delivery settings. We - in the Royal Commission Health Services Program, Yanbu - faced many challenges to providing safe and pleasant experiences for our patients, such as medication errors, under-reporting, and difficulty of communication between patients, families, and staff. We therefore had the idea of digitalizing our services and conducting our first healthcare HACKATHON. The Royal Commission Health Services Program, Yanbu, is composed of a 320-bed hospital and seven primary care centers. A healthcare HACKATHON is an event in which people with diverse perspectives such as clinicians, software developers, administrative staff, and patients come together for an intense, fun-filled event to develop solutions that could address challenges facing healthcare today. The aim was to lean processes and make it more effective and safe.

## Methods

- A quality team conducted a workshop on how to choose priorities for improvement for all departments' heads, then a condensed workshop was conducted to choose projects and to define the possibility of using information technology (IT) to lean these processes.
- Multiple meetings were conducted between process owners and the IT department to explain and clarify the ideas and draw the process flow.
- A 2-day event took place to develop and test the prototypes followed by 1 day for judging and evaluating the IT solutions developed to improve processes.

## Results

Seventeen IT solutions were developed including mobile phone applications, web-based applications, and oracle forms to improve safety and efficiency of healthcare delivery. The most important were:

- E-OVR system to report, track, and analyze incidents in the hospital
- Medication errors electronic reporting to collect and analyze medication errors
- Patient tracking system: to track and improve patient flow from outpatients to inpatients.

## Conclusion

Applying the healthcare HACKATHON had a great impact on patient/staff safety and satisfaction, which was evident by improving reporting culture and waiting times and reducing medication errors.

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# Successful intervention to reduce central line-associated bloodstream infection rate in adult intensive care unit at a specialized tertiary care hospital in Riyadh, Saudi Arabia

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## Background

Central line-associated bloodstream infection (CLABSI) surveillance in the adult intensive care unit (ICU) in King Abdullah Specialized Children Hospital showed a higher CLABSI rate during the first quarter of 2018. CLABSI is associated with a significant increase in morbidity, mortality, length of hospitalization, and the cost of healthcare. The aim of the current study was to evaluate the impact of a multifaceted improvement project aiming to reduce the rate of CLABSI.

## Methods

This was an interventional surveillance study. A Plan, Do, Check, Act (PDCA) quality improvement approach was used. The intervention was initiated in March 2018. It focused on the following aspects: standardizing the central line (CL) maintenance practices, creating a designated cart for CL insertion and maintenance, increasing compliance with aseptic techniques and CL insertion and maintenance bundles, educating the healthcare workers and patients on CLABSI prevention, environmental cleaning and disinfections, and instantaneous feedback to the stakeholders about CLABSI events. The intervention engaged multiple partners including infection control, nurses, and physicians. Surveillance methods and CLABSI definition was done according the US National Healthcare Safety Network.

## Results

During 2018, a total of ten CLABSI events were detected during 2919 central-line days. They included four, four, two, and no events in the first, second, third, and fourth quarters, respectively. After intervention, the rate significantly decreased from 5.2 per 1000 central line-days during the second quarter of 2018, to 3.9 during the third quarter of 2018, and zero during the fourth quarter of 2018 (Mantel-Haenszel chi-square p value of 0.034).

## Conclusion

A multidisciplinary multifaceted improvement project using quality improvement tools to enforce the evidence-based preventive practices has been successful in reducing the CLABSI rate. The implementation of the improvement project needs to be continued to maintain zero or low CLABSI rates.

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# Intubation in trauma patients, indications and outcomes: review of 8 years of level 1 trauma center practice

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## Background

Trauma patients are a diverse population with complex needs for ventilatory support. Securing the airway remains a central component in managing trauma patients. In the emergency setting, the decision to intubate might be influenced by the patient's initial presentation, the surroundings, and other influential factors. Established recommendations for immediate intubation are set to serve in several conditions such as airway obstruction, decreased level of consciousness, facial injuries, and others. However, in many cases the decision to intubate is less straightforward. Locally, we are lacking reports in the field intubation process and its outcome in the trauma population. The objective of this study was to describe the current practice of intubation indications in the e

## Methods

This was a cross-sectional study conducted in emergency department trauma patients from 1 January 2011 to 31 December 2018. A total of 7194 trauma patients were received during this period, of whom 1181 were intubated. Variables were obtained from the trauma registry and patients' medical files.

## Results

Of 1181 intubations, 51 patients were excluded because they were intubated when under intensive care unit (ICU) care or in the operating room (OR). The included population distribution was 1069 (94.6%) male, 61 (5.4%) female, 66.3% under the age of 30 years. The highest reported mechanism of injury was motor vehicle accident (59.4%), followed by pedestrian accident (15.4%). Indication for intubation was reported as presenting GCS of 8 or below in 43.7%, change in mental status and agitation/confusion in 12.3%, and presenting injury mechanism and severity in 7.4%. Average length of intubation was 7 days, and length of hospital stay was 41 days. 73.7% of intubated patients were successfully extubated, and 19.6% underwent tracheostomy placement.

## Conclusion

This is the first study in the region concerning indications and outcomes of trauma intubation. The most reported indication for intubation is patient GCS level. Successful extubation on room air is the highest reported outcome. The objective of this study was to describe the current practice of intubation indications in the emergency department for trauma patients and its outcome.

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# Modified Early Warning Score as a predictor for intensive care unit admission in chemotherapy-receiving oncology patients with positive blood culture

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## Background

Sepsis is a group of systemic manifestations resulting from an underlying infection that triggers an immune response that causes injury to the host. Chemotherapy-receiving oncology patients (CROPs) are particularly prone to sepsis; however, their suppressed immune system renders the signs of inflammation less evident. The Modified Early Warning Score (MEWS), with a cutoff value of  $\geq 4$ , is a tool intended to detect patients with deteriorating clinical circumstances early and to predict the need for intensive care unit (ICU) transfer. Therefore, we aimed to assess the usefulness of MEWS in predicting ICU admission and mortality in CROPs with positive blood culture.

## Methods

Electronic records of patients hospitalized in King Abdulaziz Medical City (KAMC), Jeddah, Saudi Arabia, from June 2016 to June 2017 were retrospectively reviewed. Adults older than 14 years with positive blood cultures were included and subdivided into two groups: CROP cases and immunocompetent controls; comparison was referenced to the actual ICU admittance. MEWS was calculated at different time intervals before, after, and at the time of positive blood culture in both groups to identify its discriminative capability. Receiver operator curves (ROC) analysis was used to determine the best cutoff MEWS at different time intervals.

## Results

192 individuals with positive blood culture were included: 89 CROPs and 103 controls. 21% of cases and 50% of controls were admitted to the ICU ( $p < 0.001$ ). The proportion of patients who had positive MEWS of  $\geq 4$  requiring ICU admission was 34.8% in CROPs compared with 45.6% in controls ( $p = 0.129$ ). The sensitivity, specificity, positive predictive value, and negative predictive value for a positive MEWS of  $\geq 4$  in CROPs was 52.5%, 70%, 32.3%, and 84%, respectively, and this was comparable with the control group. ROC analysis showed that MEWS was a significant predictor for ICU admission if calculated 12 to 36 hours before positive blood culture in CROPs, and a threshold of  $\geq 3$  had the best specificity (86-91%) for predicting ICU admission, whereas a threshold of  $\geq 4$  was more suitable for controls. MEWS was generally a poor predictor for mortality.

## Conclusion

MEWS in general has weak discriminatory value in predicting ICU admission in CROPs. A threshold of  $\geq 3$  MEWS at 12 to 36 hours before positive blood culture was found to be the best cutoff for predicting ICU admission in CROPs compared with a threshold of  $\geq 4$  in controls. MEWS was a poor predictor for mortality within 28 days. The combination of MEWS with clinical judgment might improve prediction for ICU admission.

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# Accelerating hemoglobin (HbA1C) test results in follow-up diabetic clinics at a primary healthcare (PHC) center using the point-of-care HbA1c testing device

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## Background

Based on daily manual patient registry data, as of September 2018, we found that all follow-up patients with diabetes (100%) at Almasif Primary Care Center in Northern Riyadh had to wait an average of 3.5 days for their hemoglobin A1C (HbA1c) results in order for their physician to make any decisions on their treatment plan. One of the main quality dimensions is the improvement of the timeliness of healthcare, including reducing unnecessary waiting that might cause a harmful delay for patient and providers. Thus, creating a lean management process for diabetic patient work-up will lead to better care in terms of awareness, diagnosis, and treatment, and improve the quality of diabetic patient care in primary healthcare. The setting of this project was Almasif Primary Health Care Center, located in Northern Riyadh, Saudi Arabia. The improvement aim was to accelerate the diabetic care follow-up process by removing the non-added value and decreasing the long waiting time for HbA1c results to less than 15 minutes on the same day of the visit among at least 80% of patients with diabetes attending Almasif Primary Health Care Center, Northern Riyadh, by November 2018.

## Methods

A multidisciplinary quality team has been formed. The team used several quality tools, such as brainstorming technique, process mapping, and cases-affect diagnosis, among others. Improvement measures included the percentage of patients with diabetes who had their treatment care plan changed due to HbA1c as the outcome measure, and the percentage of patients who had the HbA1c result in 10 minutes as the process measure. Several rapid PDSA (plan-do-study-act) cycles have been conducted to test the change idea of the point-of-care HbA1c testing device. The idea worked well and data have been analyzed and presented on a run chart showing the changes made (PDSA cycles) and improvement over time using the process and outcome measures.

## Results

All follow-up diabetic patients (17 [100%] of 17) got their HbA1c results within less than 15 minutes. And more importantly, more than half (nine [53%] of 17) of the diabetic patients had their treatment plan changed on the same day of the visit. The majority of the diabetic clinic's nurses were satisfied (eight out of ten) and competent to perform the new task.

## Conclusion

The idea of using the point-of-care HbA1c testing device is very promising to improve the quality and safety of follow-up of diabetic patients at the primary healthcare clinic. It is highly recommended to replicate the idea nationally.

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# Acquisition of carbapenem-resistant *Klebsiella pneumoniae* detected by active surveillance testing in adult intensive care unit in Riyadh, Saudi Arabia

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## Background

During the last quarter of 2017, there was an increase in the number of patients with carbapenem-resistant *Klebsiella pneumoniae* (CRKP) in the adult intensive care unit (AICU) at King Abdullah Specialist Children Hospital, Riyadh, Saudi Arabia. Worldwide, invasive infections caused by carbapenem-resistant Enterobacteriaceae, including CRKP, have been associated with high morbidity and mortality. The target population at AICU is mainly oncology patients who need critical care. It has been suggested that active surveillance testing (AST) can help to minimize exposure within selected units. Additionally, it can estimate the percentage of within-unit acquisition of CRKP. The objective of the current study was to estimate the acquisition of CRKP and the compliance with AST.

## Methods

AST was done to all patients admitted to the AICU between January 2018 to December 2018 and to those who were discharged, provided that no positive AST or clinical results were documented at admission or during the unit stay. Acquisition of CRKP was defined as positive CRKP (detected by AST or clinically) after an initial negative finding during the first 3 days of unit stay. Compliance of admission AST was defined as testing rectal specimens obtained during the first 3 days of unit stay among all admitted patients. Compliance of discharge AST was defined as testing rectal specimens obtained at discharge or after the first 3 days of unit stay among non-prevalent patients.

## Results

During the study period, 375 (90.1%) of 416 admitted patients had AST at admission. Of the 375, 180 (48.0%) were eligible for discharge AST. 87 (48.3%) of the 180 eligible patients had AST at discharge. The prevalence of positive CRKP at admission was 1.9% (seven of 375). Acquisition of CRKP during the unit stay was 3.4% (three of 87). Of 416 patients admitted to the AICU, 30.5% died, 69.0% were transferred to another unit, and 0.5% were discharged.

## Conclusion

The findings showed high compliance of AST at admission but low compliance at discharge, which needs further enforcement. Although the acquisition of CRKP was only 3.4%, it represents adding almost double (1.8) new cases of CRKP to the admission level. Future research is required to assess the impact of AST on the burden of healthcare-associated infections.

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# Evaluation of oral anticancer medication handling, storage, and disposal practices among cancer patients and their caregivers in the home setting at Princess Norah Oncology Center

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## Background

Oral chemotherapeutic agents are hazardous drugs that are commonly prescribed for a variety of indications. Using oral anticancer medications may ensure better therapy adherence, but there is not much knowledge about the safety and risks of accidental exposure with subsequent fatalities. Unintentional exposure can take place at different phases of treatment by splitting, crushing, transporting, unpacking, storage, and disposal. Although there are several well-established guidelines for safe handling of parenteral chemotherapy in the healthcare setting, there are few recommendations concerning proper handling of oral chemotherapy at home for patient and environmental safety. This survey aimed to evaluate the handling, storage, and disposal practices of oral anticancer medications among cancer patients and their caregivers in the home setting.

## Methods

A questionnaire-based cross-sectional study was done in all adult cancer patients/patient caregivers receiving oral anticancer medications and visiting the oncology outpatient pharmacy. Oncology pharmacists interviewed patients after obtaining consent. Survey responses were analysed using descriptive statistics.

## Results

A total of 201 participants agreed to be interviewed, of whom most were female (67%). Nearly 44% of participants were aged between 40 and 60 years. The majority of participants were educated (157 responses, 78%) while only 44 (22%) had never been to school. The top five oral anticancer medications taken by patients were tamoxifen, capecitabine, letrozole, dasatinib, and imatinib. All participants reported that medications were kept away from children and pets (100%). 196 (97.5%) patients responded that the medication was stored away from extreme heat, cold, and humidity. 195 (97%) patients reported keeping their medications in the original container. Hand washing and wearing gloves were not a consistent practice among patients and caregivers. Among all participants, only nine (4.5%) reported "always" wearing gloves; 48 (24%) reported "always" washing hands after handling anticancer medications. Patients and caregivers reported that they had been informed about safe handling and storage by their physician (47%) and pharmacist (30%), while 40% of them had not been informed. In terms of disposal practice, more than half (66%) of patients had not had unused or expired medications, 29% of patients dispose them in the trash, and 27% return them to the pharmacy or doctor's office.

## Conclusion

Our findings, while preliminary, suggest that patients' and caregivers' awareness regarding handling practices are inconsistent with the published recommendations. Appropriate and comprehensive education is needed to mitigate exposure risk to these agents in the home setting.



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# Improvement project to reduce Clostridium difficile infection rate among a vulnerable population in a tertiary care hospital in Saudi Arabia

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## Background

A cluster of patients with Clostridium difficile infection (CDI) had been detected during the second half of 2017 at the pediatric hematology-oncology and stem cell transplant unit of King Abdullah Specialist Children Hospital (KASCH). Most of these patients were identified after the third day of admission, and the infection met the definition of healthcare-associated infection (HAI). CDI is a global healthcare problem, which can lead to a considerable increase in morbidity, mortality, length of hospital stay, and healthcare cost. Our target population are considered immunocompromised patients who are known to be at higher risk of acquiring CDI. The objective of the current study is to describe a hospital cluster of CDI and lessons to prevent future outbreaks.

## Methods

A multidisciplinary team led by the infection prevention and control team together with nursing and environmental services has been assembled, and an action plan developed. A Plan, Do, Check, Act (PDCA) quality improvement approach was used to contain the cluster and prevent the development of a hospital-wide outbreak. PDCA included early identification of community and healthcare patients with diarrhea, empirical contact isolation of suspected cases, and education of patients' caregivers and healthcare workers to increase the awareness of CDI risk and management. Enhanced environmental cleaning by adding hydrogen peroxide fumigation to the traditional hospital-approved sporicidal disinfectants has been implemented together with the education and training of housekeeping staff. To further enhance the environmental cleaning, starting in July 2018, terminal cleaning was initiated immediately after the disappearance of diarrhea instead of waiting for final patient discharge.

## Results

A total of 57 patients were diagnosed with CDI, of whom 42 met the definition of HAI. Of those who had HAI CDI, 50% were male and 50% were female. The average age was  $6.5 \pm 4.0$  years. The number of cases was considerably high in the first quarter of 2017. Thereafter there was a reduction in the number of patients during 2017, followed by an increase then disappearance of cases during 2018.

## Conclusion

The implementation of multifaceted evidence-based infection control strategies that enhance the role of multi-healthcare services in collaboration, education, and environmental cleaning was successful in significantly reducing the incidence of CDI. Larger scale implementation of the same strategy may be justified to reduce the risk of similar clusters in the future.

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# Reduce medication administration delay in neonatal intensive care unit

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## Background

Medication errors are the most common medical errors experienced by patients. Neonates are even more vulnerable to medication errors because of drug dosing that is influenced by weight, gestational age, and postnatal age. Data obtained from the safety reporting system related to medication and fluids events in the neonatal intensive care unit (NICU) from January to August 2017 indicated a high rate of near-misses and errors reaching patients. The top five specific event types related to medication and fluids events were, in the following order: delay, incorrect dose, incorrect frequency, medication packaging issues, and dose omitted.

## Methods

In September 2017, a project team was formed including members from the following disciplines: neonatology, neonatal nursing, pharmacy, medication safety program, and quality department. Data obtained from the safety reporting system were examined and analyzed. After thorough analysis of the data, the project team agreed to tackle the delay in STAT medication administration in the first cycle of the project. The team also completed a process map and cause and effect diagram to understand the root causes of the delay. The average time required for a STAT medication or fluid to be administered to the NICU patient was 3 hours, and the delay in STAT medication was mainly related to septic shock and suspected sepsis management. To reduce the delay in STAT medication administration, the NICU must be provided with a floor stock of pre-mixed antibiotics that is readily available for administration when required. A standardized order set for septic shock doses was programed in the BestCare System to reduce the time and effort required in generating orders. All the stakeholders involved in the process were made aware of the new changes and a departmental policy was created to guide the staff practice.

## Results

After the implementation of the pre-mixed antibiotic floor stock and pre-set orders, the turnaround time for administration of STAT medication in the NICU reduced from 3 hours to 1 hour, and there was a 60% reduction in the delay in medication administration events.

## Conclusion

The new changes in the process impacted positively on patient safety and prevention of harm. They reduced time and redundancy in the previous process. The changes also improved staff satisfaction and reduced the tension that used to result from the frequent communication and follow-ups involved until the appropriate medication was made available for administration.

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# Successful establishment of an infection control link-nurse program as a tool to enhance the implementation of infection control standards in a tertiary care hospital in Saudi Arabia

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## Background

The current human resources of the infection control program make it impossible to audit infection control practices in all hospital units continuously. Therefore, it has been suggested that establishing an infection control link-nurse in different hospital services may support and enhance implementation of appropriate infection control practices. Sustained compliance of healthcare workers with infection control standards is a major challenge for infection control practitioners. Increasing the awareness of appropriate infection control practices among some healthcare workers is a critical step for establishing an infection control link-nurse.

## Methods

The Infection Control Practitioners (ICPs) of King Abdulaziz Medical City Riyadh (KAMC-R) and King Abdullah Specialist Children Hospital (KASCH) performed six training sessions; each session was a 2-day program with pre-test and post-test evaluation. The evaluation consisted of 20 questions covering all basic infection control information such as infection prevention risk assessment, surveillance plan, standard and expanded precautions, hand hygiene, management of multidrug-resistant organisms, management of outbreaks, and antimicrobial stewardship program awareness.

## Results

A total of 236 trained nurses were evaluated. They included 27 nurse managers, 74 charge nurses, 22 clinical resource nurses, and 113 staff nurses. They were working in intensive care units and wards of KASCH (n=61), KAMC (n=146), and outpatient clinics of primary healthcare centers (n=29). The overall mean result of the pre-test evaluation was 69.30% and the overall mean result of the post-test evaluation was 89.60%, which represented a 29.3% improvement in awareness. The improved awareness was highest among staff nurses (42.70%) and lowest among nurse managers (20.13%).

## Conclusion

Our training sessions covering basic infection control practices were successful in significantly improving the awareness of the infection control link-nurse. Further research studies are needed to evaluate the impact of the infection control link-nurse program on compliance rates of appropriate infection control practices and on the rates of healthcare-associated infections in their respective service locations.

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# Knowledge and attitudes regarding child safety at home in Saudi Arabia

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## Background

Unintentional injury to children at home is a public health problem and a significant cause of death and disability, accounting for 40% of all child deaths. There have been few to no studies in Arabic countries showing the prevalence of home injuries among children. Our aim was to assess adults' knowledge and attitudes regarding child safety at home in Saudi Arabia.

## Methods

A cross-sectional study was conducted with 1301 participants in August 2017. Participants were older than 18 years and had at least one child in the family. Data were collected through an online questionnaire assessing participants' beliefs, knowledge, and behavior. Data were analyzed using descriptive statistics, t-test, and one-way ANOVA.

## Results

The results showed that sex, age, marital status, employment status, and type of accommodation played key roles in awareness regarding child safety at home. Out of 1301 participants who returned the questionnaire, 60.6% of the participants always participated in the care of children. There were significant differences according to sex, with females having higher knowledge and practice scores and total scores ( $p < 0.001$  for both). Participants in the age group of 18-25 years had significantly lower scores in knowledge and practice and total scores than did the other two age groups ( $p < 0.001$  for both). Single participants had significantly lower scores in knowledge and practice than did married, divorced, and widowed participants ( $p < 0.001$ ). Student participants had significantly lower scores than all other groups in beliefs, and knowledge and practice ( $p = 0.029$  and  $p < 0.001$ , respectively). The group living in flats had higher knowledge and practice scores than those living in villas and shared houses ( $p < 0.001$ ). Female participants and those aged above 25 years, married, employed, and residing in flats had more awareness than did other groups.

## Conclusion

The majority of participants had good awareness of child safety at home. Despite the high levels of awareness, we recommend more public health education to improve awareness and methods of preventing these injuries.

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# Knowledge and practice of preventing hemodialysis catheter-related bloodstream infection (CRBSI) among renal nurses in Saudi Arabia: a pilot study

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## Background

Renal nurses were found to have poor compliance with strict infection control practices while caring for patients undergoing hemodialysis treatment. All the nurses have attended infection control courses from various sources. The poor compliance with guidelines among nurses indicated the need for further intervention. Dialysis CRBSI is a nosocomial infection caused by healthcare providers, specifically renal nurses in the dialysis setting. The Centers for Disease Control and Prevention reported an estimated 37,000 CRBSIs in chronic hemodialysis patients annually in 2008. Studies have shown that gaps exist between knowledge and practice, which must be addressed using evidence-based prevention interventions. This study aims to explore and to determine renal nurses' knowledge and standard of practice in preventing CRBSI in Saudi Arabia.

## Methods

A convenience sampling method was used to distribute 40 questionnaire sets to the renal nurses in two dialysis facilities under the Ministry of National Guard Health Affairs, Saudi Arabia.

## Results

All renal nurses from two dialysis facilities (n=40: 18 PMBAH, 22 KAIFDC) participated in the study. 10% (n=4) of nurses had a moderate knowledge level, while 90% (n=36) had a high knowledge level. Renal nurses had a significant good practice in taking a blood sample from the dialysis catheter source, with 34 (85%) nurses (PMBAH: n=16 [88.9%], KAIFDC: n=18 [81.8%]) achieving a good standard of practice. However, 30 (75%) nurses (PMBAH: n=15 [88.9%], KAIFDC: n=15 [81.8%]) were found to have a significantly low standard of practice in maintaining aseptic technique during the termination of dialysis treatment. There was no significant relationship between the standard of practice and the level of knowledge in preventing dialysis CRBSI among the renal nurses in Saudi Arabia.

## Conclusion

Nurses working in hemodialysis settings must be adequately trained and educated on infection control procedures while caring for patients. Awareness of the complications a patient may encounter with CRBSI should be emphasized. Training and knowledge improvement are the most efficient ways to fight healthcare-associated infection in preventing hemodialysis CRBSI. Knowledge alone is insufficient to sustain good infection control practice. It is paramount to have adequate staffing to ensure nurse adherence to high infection control practice during peak hours, especially during the start and end of hemodialysis treatment.

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# A comparison of glucometers used at King Abdulaziz Medical City, Jeddah, 2018

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## Background

Glucometers have become a fundamental tool in measuring and monitoring glucose level, both in healthcare institutions and home care. The accuracy of glucometers affects the quality of management of diabetic patients and is associated with the occurrence of over-treating or under-treating accidents due to inaccurate readings. This study assessed the accuracy of five commercially available glucometers by reference to laboratory venous plasma glucose (PG) measurement.

## Methods

A cross-sectional study was conducted among patients with diabetes attending King Abdulaziz Medical City laboratory. All participants underwent venipuncture regarding laboratory PG, simultaneously with capillary blood sampling, on which capillary glucose (CG) was measured using the glucometers AccuCheck®, OneTouch®, Freestyle Optium Neo®, Contour Next®, and Contour Next One® in random order. All glucometers were adequately calibrated and verified according to American Diabetes Association guidelines before use. Bias was calculated for each glucometer as the difference between CG and PG ( $\Delta\text{CG-PG}$ ). One-sample t-test was used to analyze mean  $\Delta\text{CG-PG}$  by reference to zero for each of the glucometers. Bland–Altman analysis was undertaken by plotting  $\Delta\text{CG-PG}$  against PG. Proportional bias was investigated by analyzing the relationship between  $\Delta\text{CG-PG}$  and PG using linear regression.

## Results

A total of 203 patients were included, with mean PG 155.22 (SD 64.88) mg/dL. The coefficient of variation of the meters ranged from 37.79% to 41.80%. Mean CGs ranged from 153.01 (SD 57.82) to 163.00 (SD 64.52) depending on the glucometer. Three meters showed negative bias. Mean difference was 2.20 for AccuCheck, -2.26 for One Touch, 0.90 for Freestyle, -2.08 for Contour Next, and -7.78 for Contour Next One. Bias percentage ranged from -5.01 to 1.42. Bland–Altman plots showed proportional bias (an increase in the magnitude of the error as the test result increases). Proportional bias was supported by the significant linear regression analysis for all glucometers.

## Conclusion

Of all glucometers, Freestyle Optium Neo showed the minimal mean bias, while Contour Next One showed the highest proportional bias. However, all of the glucometers were within 5% difference. High blood glucose readings above 200 mg/dL should be confirmed by venous measurement.

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# Bacterial contamination and stethoscope disinfection practices: a cross-sectional survey among residents at King Abdulaziz Medical City, Western Region of Saudi Arabia, 2018

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## Background

Although knowledge of healthcare providers regarding stethoscope care is reasonable, their practices regarding stethoscope disinfection after use have been consistently reported to be quite poor, with the results of several hospital-based local and international studies showing a high prevalence of stethoscope contamination. The objective of this study was to assess prevalence of bacterial colonization of stethoscope diaphragms and to explore knowledge, awareness, and practices of residents in different departments.

## Methods

A cross-sectional study was carried out among residents at King Abdulaziz Medical City, the National Guard Hospital, Jeddah, Saudi Arabia, throughout the period 1 April to 31 May 2018. Residents of specialties with expected low stethoscope use were excluded. A 17-item valid self-administered study questionnaire was developed and used for data collection. It included personal characteristics, assessment of residents' knowledge regarding stethoscope contamination, practice of stethoscope disinfection, and residents' awareness regarding stethoscope cleaning and disinfection. The stethoscopes used by participants at the time of completing the questionnaire and their diaphragms were sampled for culture and sensitivity. When three or more colony-forming units were found on a plate, the organism was regarded as a bacterial contaminant. The isolated bacteria were assessed by colony characteristics, morphology, and Gram reaction and biochemical tests.

## Results

The study included 170 resident physicians. Their age ranged from 24 to 34 years with a mean of 27.1 (SD 1.7) years. 54.1% were female. The average number of hours of patient contact per 24 hours was 7.0 (SD 2.4) hours. Prevalence of bacterial colonization was 63.5% (108 of 170) whereas that of bacterial contamination was 50.6% (86 of 170). Organisms were present in nine specimens (5.3%). The most common isolated organism was *Bacillus* sp (three [33.3%] of nine). The highest rate of bacterial contamination was reported among emergency medicine residents (81.8%), whereas the lowest rate was observed among internal medicine residents (32.1%,  $p=0.001$ ). More experienced residents were more likely to have bacterial contamination, because the mean experience of residents who showed bacterial contamination was significantly higher than others ( $2.72\pm 1.67$  versus  $2.27\pm 1.22$ ,  $p=0.048$ ). Longer time since last cleaning of the stethoscope was significantly associated with bacterial contamination ( $p=0.020$ ).

## Conclusion

Bacterial contamination of the stethoscope is a common problem among resident physicians, affecting almost half of them, particularly those working in the emergency department and those who had not cleaned their stethoscope for a long time. Therefore, continuing training and education to encourage resident physicians to continuously clean their stethoscope could reduce stethoscope contamination and prevent hospital-acquired infections.

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# The benefits of combining risk management with performance improvement in reducing preventable hospital readmission

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## Background

With the constraints of limited resources within highly complex systems like in the healthcare industry, it is crucial to identify and eliminate waste to ensure better resource utilization and more simplified procedures to reduce errors and repetition. Focusing on the core of quality management with a model to simplify processes and make them more LEAN with minimum waste, we adopted a new model based mainly on two newly created tools: simplification matrix and simplification index.

## Methods

In Royal Commission Health Services, we adopted a new model based mainly on two newly created tools: simplification matrix and simplification index. These tools were used by team approach to lean the process and reduce redundancies, through reviewing the discharge process, patient education tools, and a medication reconciliation process.

## Results

Unplanned hospital readmission was reduced by more than 60%, which led to safer care, better resource utilization, and cost savings around \$250,000.

## Conclusion

Combining performance improvement and risk management techniques led to significant process improvement and sustainable results.



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# Inappropriate prescribing in elderly inpatients at a university hospital in Saudi Arabia

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## Background

Elderly populations usually use more medications than any other age group and are therefore more susceptible to potentially inappropriate prescribing (PIP), drug–drug interactions, and the related health consequences. In this study, we aimed to determine PIP prevalence and explore the most common potentially inappropriate medications (PIMs) prescribed.

## Methods

This was a retrospective study involving elderly patients admitted at King Abdulaziz Medical City-Jeddah (KAMC-JD), between November 2014 and January 2015. We included all elderly patients aged 60 years and older admitted to KAMC-JD through the emergency department (ED), clinic, and direct admissions during the study period. Patients admitted to the intensive care unit, oncology department, and/or those who passed away in the ED before admission were excluded from the study. Prescriptions were assessed for PIP using the 2012 Beers Criteria, which categorizes PIMs to three classes: first class are medications to avoid in older adults regardless of their conditions; second class are medications to avoid with certain diseases or syndromes; and third class are medications that should be used with caution.

## Results

Our study included 135 patients, of whom 49.6% were male. The mean age was  $71.26 \pm 8.1$  years. According to the 2012 Beers Criteria, 80% of patients were using at least one listed PIM. For the criteria's first, second, and third classes, PIM prescription rates were 72.6%, 59.2%, and 37.7%, respectively. Regarding the most prescribed PIM in each class, insulin (sliding scale) was the most reported PIM in the first class, nonsteroidal anti-inflammatory drugs (NSAIDs) in the second class, and, lastly, vasodilators in the third class.

## Conclusion

PIP is a serious health issue threatening elderly patients. There is a need to develop evidence-based, context-sensitive, and user-friendly tools to assess PIP, as well as supportive training programs.

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# Comparing antifungal prophylaxis efficacy between fluconazole and amphotericin B lipid complex in adult patients with acute lymphocytic leukemia (ALL) receiving hyper-CVAD-based chemotherapy

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## Background

Fungal infection is common in acute lymphocytic leukemia (ALL), which can lead to significant mortality and morbidity. Our aim is to compare the efficacy of antifungal prophylaxis using fluconazole 400 mg once daily versus amphotericin B lipid complex 2.5 mg/kg three times per week in adult patients with ALL during the neutropenic nadir who received hyper-CVAD as part of their chemotherapy regimen.

## Methods

This was a retrospective, cohort chart review study conducted in eligible patients with ALL who received a hyper-CVAD-based chemotherapy regimen between 1 January 2007 and 31 December 2016 at KAMC, Jeddah. We included patients with ALL aged older than 14 years who completed at least one course of hyper-CVAD and received antifungal prophylaxis. We excluded patients who received the BFM regimen. Data were collected using a hospital information system. The primary endpoint was the incidence of fungal infection, which was assessed using microbiology data and imaging studies for radiological evidence of fungal infections. The secondary endpoints were to assess QTc prolongation in Philadelphia-positive ALL that is associated with fluconazole use in combination with tyrosine kinase inhibitor, and lastly the cost impact based on the type of antifungal prophylaxis used.

## Results

A total of 105 cycles of hyper-CVAD were reviewed. In 70 cycles, fluconazole was used as antifungal prophylaxis (n= 70) and in 35 cycles amphotericin B lipid complex was used (n=35) as antifungal prophylaxis. Microbiologically documented fungal infection was found in two of 70 cycles in the fluconazole group and radiologically documented fungal infection was found in one patient in the fluconazole group. QTc prolongation was observed in 12 cycles. In nine of 12 cycles, events of QTc prolongation were observed during the study, fluconazole was used as antifungal prophylaxis, and patients were on tyrosine kinase inhibitor. In three of 12 cycles, events of QTc prolongation were observed during the study, amphotericin B lipid complex was used as antifungal prophylaxis, and patients were on tyrosine kinase inhibitor.

## Conclusion

Fluconazole is considered as standard antifungal prophylaxis in patients with ALL with acceptable safety profiles. Fluconazole had comparable efficacy to amphotericin lipid complex. Fluconazole may cause QTc prolongation when used in combination with tyrosine kinase inhibitors and patients need to be monitored more closely when this combination is used in those with Philadelphia-positive ALL.

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# Consistency of CT-KUB radiation dose and exposure parameters in King Abdul-Aziz Medical City in Jeddah: quality assessment

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## Background

Computed tomography (CT) is a type of medical imaging that uses x-rays to generate cross-sectional images of the body. Although CT improved the limitations in conventional radiography, the effective dose for CT procedures is higher than the dose of a conventional radiographic examination of the same part. For instance, the radiation dose for kidney, ureter, and bladder (KUB) in conventional radiography is 0.7 mSv, whereas in the CT scan it is 10 mSv. Therefore, patient radiation safety in compliance with American College of Radiology (ACR) standards has to be maintained. In this study, we aimed to evaluate the patient radiation dose delivered in unenhanced CT-KUB examinations using two CT machines at King Abdulaziz Medical City in Jeddah (KAMC-JD).

## Methods

This was a retrospective, cross-sectional study of all patients who had unenhanced CT-KUB examinations in KAMC-JD between 1 January and 30 June 2018. Patient characteristics and radiation parameters were obtained from the hospital information system and pictures archiving and communication system, respectively, and compared with the ACR standards.

## Results

A total of 264 patients were included in the study: 199 (75.5%) examinations were performed with machine 1 and 65 (24.6%) were performed with machine 2. Mean age was  $48.1 \pm 16.3$  years and 66.7% of patients were male. Mean body-mass index (BMI) was  $29.59 \pm 6.45$  kg/m<sup>2</sup>. The mean volume CT dose index (CTDI<sub>vol</sub>), dose-length product (DLP), time(s), pitch, and effective dose were significantly different in the CT machines with p values between 0.004 and <0.001. No significant differences were found in kVp, slice number, slice thickness, length of cover, and effective dose with use of different types of CT. Both CT machines were within the ACR standard range of 10mSv. There was a positive strong correlation between BMI ( $29.6$  kg/m<sup>2</sup>) and the effective dose ( $p < 0.001$ ).

## Conclusion

The radiation doses delivered by the two CT scanners in KAMC-JD are compliant with ACR standards. Periodic assessment is recommended every 2 years.

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# Attitude and practice of surgical informed consent among the surgical team in a teaching center: a cross-sectional study

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## Background

Surgical informed consent is an essential part of a surgical procedure that is based on good communication between patients and physicians. Informed consent is an important part of medical practice worldwide. It goes beyond just a signature; it provides knowledge to help patients make their own decisions. We aimed to evaluate the competency and training level of the surgical team in taking informed consent at King Abdulaziz University Hospital.

## Methods

We conducted a cross-sectional study among 255 doctors to evaluate their experience of consent at King Abdulaziz University Hospital, Jeddah, Saudi Arabia, between May 2018 and June 2018. Data for this research were collected by a 14-point questionnaire and entered into Microsoft Excel. Statistical analysis of the data was done with SPSS version 21. Frequencies and chi-squared test were applied to analyze data.

## Results

Of 188 participants who returned the questionnaire, 95.2% had experienced obtaining surgical consent. 35.5% of interns, 78.9% of junior residents, 87.5% of senior residents, and 54.54% of specialists mentioned that they always take consent from the patients, 37.23% reported knowledge of "all" steps of surgical procedures. 77 participants claimed to know "all" the risks of surgical procedures. Interns were the least comfortable while taking consent. Two specific questions were asked to junior doctors. More than half (59.1%) of junior doctors have never been supervised while taking consent.

## Conclusion

We found that senior doctors are the team members who most frequently obtain surgical consent. However, a number of unqualified junior doctors are still obtaining consent. Several suggestions were mentioned in the study to enhance the process of surgical informed consent, such as the surgical department in university hospitals making observation of procedures a necessity for undergraduates to enhance their competency. Supervision of junior doctors by seniors is also recommended.

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# Safety reporting system management: Six Sigma approach

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## Background

Safety incidents can affect patients, visitors, staff, or program facilities. Unclosed incidents exceeding the specific timeframe (beyond 10 days) for medium risk and low risk incidents can result in delayed implementation of corrective actions and increase recurrence of the incident. The average compliance rate for the closure time of reported incidents for medium risk and low risk incidents, hospital-wide, through the electronic safety reporting system (SRS) within 10 days was only 14% during the first three quarters of 2017. The aim of this study is to analyze the effect of Six Sigma in reducing the closure time of safety reports to less than or equal to 10 days in Prince Mohammad Bin Abdul Aziz Hospital.

## Methods

This study was done with Six Sigma methodology using the five phases of Define, Measure, Analyze, Improve, and Control (DMAIC) using various quality tools. The goal was fixed as the reduction in time to closure of safety reports for medium and low risk incidents to less than or equal to 10 days complete resolution. Significant improvement was achieved by activating Quality and Patient Safety Department staff in closing the SRS assigned per category, a Nursing Quality Team assigned as SRS liaison according to assigned units, and formation of Medication Used, Process, and Error Subcommittee especially assigned to monitor medication error safety reports and was divided into four sections: Physician, Pharmacy, Nursing, and Quality.

## Results

After implementation of improvement strategies, there was a marked reduction in defects and also improvement of Sigma rating from defect per million opportunity of 855,236 with Sigma level 0.4 to defect per million opportunity of 211.927 with Sigma level 2.3, which means that there was a significant increase in overall compliance of closing and resolving the medium and low risk safety report within 10 days from 14% to 79%.

## Conclusion

This study concluded that the Six Sigma (DMAIC) methodology was significant in reducing the closure of safety reports to within 10 days and ensuring patient safety by immediate implementation of corrective action to prevent recurrence of incidents

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# Outpatient follow-up is associated with reduced emergency department visits in patients with sickle cell disease: a retrospective cohort study from Riyadh, Saudi Arabia

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## Background

Pain is the main source of distress in patients with sickle cell disease (SCD). Unmanageable pain, often termed “crises”, may prompt unexpected visits to the emergency department (ED) or other acute healthcare facilities. One study from the Eastern Province in Saudi Arabia reported that 64% of patients with SCD present to the ED more than three times over a 6-month period. Outpatient follow-up may have a role in preventing ED visits, but this has not been fully explored in Saudi Arabia. This study aimed to assess the relation between outpatient follow-up and future ED visits due to painful crises in patients with SCD.

## Methods

This retrospective, observational study utilized data from the electronic medical record system at King Abdulaziz Medical City, National Guard Health Affairs in Riyadh. The study included adult patients with SCD who presented at least once to the ED due to a painful crisis between January 2016 and December 2017. The time between ED visits due to painful crises was set as the outcome variable. Cox regression analysis with random effects model (frailty model) was used to determine the effect of outpatient follow-up at 15 days, 30 days, and 90 days on the time to next ED visit. Baseline characteristics and previous history of sickle cell complication were included in the model as confounders.

## Results

Eighty patients with SCD presented a total of 463 times to the ED due to painful crises. 54% of these visits required admission and resulted in a total length of stay of 1474 hospital days and 49 ICU days. Attendance at a hematology outpatient clinic within 30 days from discharge significantly reduced the hazard of an ED visit due to a painful crisis compared with no follow-up (hazard ratio 0.70, 95% CI 0.52-0.94,  $p=0.02$ ).

## Conclusion

Appropriate outpatient referral at discharge may be associated with decreased ED visits. These benchmark results invite further investigation into the effects of outpatient management on preventing painful crises in patients with SCD.

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# Performance, barriers, and satisfaction of physicians towards an electronic medical record system (NGH All Region)

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Family Medicine

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## Background

Improvement in the quality of healthcare through use of an electronic medical record (EMR) system depends on getting the greatest number of physicians to effectively use the system. The objective of this study was to assess performance, satisfaction, and barriers affecting the implementation of EMR systems in different departments and centers of a tertiary hospital.

## Methods

A cross-sectional analytical study was carried out across all sectors, departments, centers, and clinics of a tertiary hospital in Jeddah, Saudi Arabia, during the year of 2017. All healthcare providers (n=2553) were invited to participate. A self-reporting questionnaire consisting of multiple-choice closed-ended questions comparing EMRs to routine paper records was distributed through the institutional e-mail, using the Perseus online survey application.

## Results

The study included 1010 healthcare providers out of the targeted 2553, giving a response rate of 39.6%. Of those surveyed, 49.1% were younger than 35 years of age, 62% were female, and 53.1% were Saudi. Overall, 64.8% of participants found the performance of some tasks easier when using EMR compared with previous routines. Participants agreed to be satisfied with the system's information and terminology (68.6%), screen design and layout (72.9%), system capabilities (41.7%), technical support and service (50.7%), and ease of use (72.7%). Healthcare providers who have attended EMR training expressed significantly higher scores concerning the performance of EMR ( $p < 0.001$ ). The highest agreed-upon barriers by the participants were the temporary loss of access to patient records if the computer crashes or power fails (65.5%), privacy and security concerns (54.5%), and lack of proper doctor-patient communication (48.4%).

## Conclusion

The performance of the EMR system and satisfaction with its use among healthcare workers in Jeddah, Saudi Arabia, is generally acceptable, particularly among those who have attended training courses in EMRs.

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# Impact of implementation of “Sickle Cell Disease Acute Painful Crisis Clinical Pathway” at KFAFH on reducing the number of ER visits, admission, readmission rates, opioid consumption, and cost

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## Background

Vaso-occlusive crisis is the most common complication of sickle cell disease (SCD) in adults, which is the primary reason why these patients seek medical care in emergency departments (EDs). We noticed increasing numbers of ED visits with a painful crisis together with increasing consumption of opioids. Therefore, a clinical pathway for the management of SCD acute painful crisis has been initiated at KFAFH in Jeddah. The main objectives of this clinical pathway management were to unify practice, standardize care, and promote judicious use of opioids at KFAFH. The aims of this study were:

- To reduce the rate of ER visits per patient by more than 50% within 1 year
- To decrease the rate of admissions per patient and readmission rates by more than 30% and 40%, respectively, within 1 year
- To reduce the consumption of meperidine and tramadol by more than 25% and 40%, respectively, within 1 year as a secondary outcome.

## Methods

A clinical pathway for the management of SCD acute painful crisis has been initiated at KFAFH in Jeddah. A total of 374 patients with SCD (aged 12 years or older with isolated painful crisis) was identified by KFAFH Emergency Department registration data. The primary source of patient information was the patient file, ED registration, and chart review for 1 year before (May 2016 to April 2017) implementation of the clinical pathway and 1 year after (May 2017 to April 2018) implementation of the clinical pathway.

## Results

ED visits:

- The annual rate of ED visits per patient dropped by 75.55% (45 versus 11.5).
- There was a progressive reduction in the frequency of ED visits over the year.

Admission rate:

- The rate of admissions per patient dropped by 41.87%.

Readmission rate:

- The readmission rate declined by 54.51%.

Opioid consumption:

- Consumption of opioids decreased by 33% for meperidine 100 mg and by 41.6% for meperidine 50 mg. Consumption significantly decreased by 54% for tramadol capsules and by 33% for tramadol injection.

Cost saving:

- The cost saved after implementation of the clinical pathway is more than 410,709 SR.

## Conclusion

Proper pain management for patients with SCD leads to a significant decrease in ED visits, and reduces hospital admissions and readmission rates. Consequently, more than 400,000 SR was saved after the implementation of the pathway. We believe that physicians, nurses, and patient education sessions played a critical role in the success of the clinical pathway.



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# Quality of life of patients post open cardiac surgery at tertiary care center (2-year retrospective study)

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## Background

Every minute a patient dies because of acute coronary heart disease in the USA. To prevent death, multiple cardiac procedures are done; however, these procedures do not guarantee a better quality of life. No research has been conducted in Saudi Arabia and the Gulf region regarding quality of life of patients post cardiac surgery. The aim of this study was to explore the quality of life of patients who underwent open cardiac surgeries in King Faisal Cardiac Center-King Abdulaziz Medical City-Western Region of Saudi Arabia during 2015-2017. The study assessed the quality of life of surviving patients and identified the association between demographic characteristics and quality of life domains.

## Methods

A cross-sectional retrospective study was done at King Faisal Cardiac Center. A convenience sample was used by identifying all patients who underwent open cardiac surgery between June 2015 and May 2017. 163 patients were eligible for our study, of whom 94 were valid for analysis. These patients were sent the SF-36 questionnaire, which is proven to evaluate quality of life. The survey is divided into eight major domains, which were reported as mean scores. Correlation was done using the Mann–Whitney U test, using a cutoff p value of 0.05.

## Results

The study reported that subscales of role limitations due to emotional problems and physical health were the lowest of the eight domains. However, the emotional well-being and the pain subscales were the highest of them all. We found that cardiovascular diseases, compared with other comorbidities, had the biggest effect on lowering quality of life.

## Conclusion

The results of the present study indicate that quality of life of patients who underwent cardiac surgery is affected negatively. The immediate post-operative duration is a vital factor that impacts long-term quality of life; therefore, hospital services need to increase their efforts regarding this critical period. Further studies should be done to explore the reasons behind these findings.

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# Assessment of adherence to international antibiotic prescription guidelines in dental clinics in primary healthcare centers in National Guard, Western Region, Saudi Arabia

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## Background

Antibiotics have played a major role in the treatment of infectious diseases since 1928; however, the overuse of antibiotics has contributed to the development of antibiotic-resistant pathogens. According to the Centers for Disease Control and Prevention (CDC), at least 30% of prescribed antibiotics are unnecessary in the USA. Following the CDC checklist, practitioners should avoid non-evidence-based historical prescriptions and ensure that prescriptions are not written on the basis of patient expectations, convenience, or pressure from colleagues. In certain cases, such as when a patient presents with extra-oral swelling, trismus, or the need for a surgical intervention, an appropriate regimen of antibiotics is indicated; otherwise, systemic antibiotics should not be the routine treatment of choice. This study aims to determine and assess adherence to CDC guidelines for antibiotic prescriptions in dental clinics at National Guard Primary Healthcare Centers, Western Region, Saudi Arabia.

## Methods

The study was carried out at National Guard Primary Healthcare Centers in Western Region, Saudi Arabia. Records of all patients with antibiotic prescriptions during their dental visits from January 2017 to June 2018 were sampled through simple random sampling; medically compromised patients were excluded. Dentists' adherence to the guidelines was assessed. MS Excel was used for data entry, and SPSS version 23 was used to analyze the data, using the chi-squared test for significance.

## Results

A total of 385 clinical records were reviewed, of which 30% of the antibiotics were ordered without proper documentation of the diagnosis. Only 11.2% of the prescriptions adhered to the guidelines, while the other 88.8% did not follow the guidelines, including improper documentation. There was a significant difference between the prescriptions that did and did not follow the guidelines. On the other hand, the relation between the dentist's level of education and adherence to the antibiotic prescription guidelines was not significant.

## Conclusion

There is inadequate adherence to the international guidelines among dental practitioners in dental clinics in primary healthcare centers in the National Guard. This irrational antibiotic prescribing accounts for the risk of antibiotic resistance, so there is a need to address antibiotic prescribing practices by increasing awareness among dental practitioners in these clinics.

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# Assessment of radiation protection awareness and knowledge about common radiological examination doses among healthcare workers in Riyadh, Saudi Arabia: a cross-sectional study

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## Background

Access to ionizing radiation for diagnosis and treatment purposes continues to be widened every day. This advancement has been associated with radiation hazard related to radiation exposure for both patients and healthcare workers. Raising the level of awareness about radiation protection and knowledge about common radiological examination doses among healthcare workers is important to maintain the safety of the healthcare setting. Evidence related to these issues is limited and results vary because of different ways of assessment. The purpose of this study was to assess the level of awareness about radiation protection and knowledge about common radiological examination doses among physicians, radiology students, radiological technologists, and medical students for the first time in Riyadh.

## Methods

A descriptive cross-sectional study was carried out among different healthcare workers from health science universities and hospitals in Riyadh. Through an online tool, a validated questionnaire was administered to physicians, radiology students, radiological technologists, and medical students. The questionnaire consisted of 16 multiple choice questions and focused on the awareness of radiation protection issues and knowledge about common radiological examination doses.

## Results

A total of 522 individuals completed the questionnaire. The majority of participants were medical students (29%) followed by radiological technologists (28%). 38% of the participants have attended training courses and the majority of them have sufficient awareness of radiation protection; however, the mean score of the correct answers for all questions that were related to radiation protection and common radiological examination doses was 15 (SD 1.5), with physicians and radiological technologists achieving a higher mean score compared with the other groups. Most participants underestimated the radiation doses from ionizing radiation procedures. By contrast, with regard to non-ionizing radiation procedures doses, the majority of participants answered correctly and some of them tended to overestimate.

## Conclusion

The findings of this study provide insight into ionizing radiation-related issues in order to set up training programs for healthcare workers to raise awareness about radiation hazard and create safe clinical settings.

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# Patient-based retrospective dose audit for common radiographic examinations

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## Background

Retrospective dosimetric auditing is a useful investigational approach for continuous quality assurance in diagnostic radiography. It may serve as a baseline reference for future research in which both dose and image quality are examined. In radiation protection, comparing diagnostic reference levels (DRLs) with patient doses observed in clinical practice enables the optimization process (i.e., providing a clinically acceptable image quality and keeping the dose as low as reasonably achievable). The purpose of this study was to audit radiation doses of adult patients who underwent common diagnostic x-ray examinations and compare dose area product (DAP) values with the established international DRLs (IDRLs).

## Methods

Retrospective cross-sectional records of 193 patients who underwent 387 radiographic examinations during October through December 2018 were obtained. Patient-related and DAP data were recorded for the six most common examinations with two digital systems of the same manufacturer at King Abdulaziz Medical City in Jeddah (KAMC-JD). The mean and 75th percentile of DAPs were established and compared with IDRLs. The percentage mean and 75th percentile DAP differences were used to describe changes between KAMC-JD values and IDRLs.

## Results

Relative to chest and cervical spine x-rays, wider dispersion and increased variability in DAP values were observed and evidenced by a larger standard deviation for lumbar spine (AP  $\sigma=170.29$ ; lateral  $\sigma=409.92$ ), thoracic spine (AP  $\sigma=43.22$ ; lateral  $\sigma=440.44$ ), abdomen ( $\sigma=131.62$ ), and pelvis ( $\sigma=254.59$ ). Overall, the DAP 75th percentiles for KAMC-JD were below IDRLs for chest, cervical spine, abdomen, and pelvis. Lateral lumbar, and AP and lateral thoracic spine DAP 75th percentile exceeded all IDRLs by up to 42.56%, 1.68%, and 512.17%, respectively. When the type of detector is considered, KAMC-JD mean DAPs exceeded the UK 2012 DRLs for the following examinations: AP and lumbar spine (42.83%, 110.8%), AP pelvis (8.06%), AP and lateral cervical (62.86%, 10.71%), and AP and lateral thoracic (36.27%, 355.78%).

## Conclusion

KAMC-JD DAP data were below the international recommendations except for lumbar spine, which exceeded the recommendations. Reassessment after optimizing the lumbar spine DRL is recommended. This study highlights the need for developing local DRLs in Saudi Arabia at the institutional, regional, and national level.

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# Do patients understand what they consent for? Analysis of discordance in patient–physician understanding of the chemotherapy plan

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## Background

The journey towards better patient safety starts with effective patient–physician communication. This is true for cancer patients, in whom treatments are complex and patients' understanding might be compromised. Multiple factors can result in discordance in patient–physician agreement including patients' and physicians' personal factors, complexity of the disease, and the setting of care. The present work investigates the discordance between patients and their doctors in understanding the chemotherapy plan in Princess Norah Oncology Center, Jeddah.

## Methods

This was an interview-based cross-sectional study. A total of 151 patients were interviewed along with their oncologists within 24 hours of a patient–physician encounter. The survey included both physicians' and patients' demographics, goal and duration of therapy, method of assessing the response, and chemotherapy side effects. SPSS was used for analysis to compare patients' understanding with physicians' responses.

## Results

Patients achieved more than 50% agreement with their physicians in four major domains: type of malignancy (81%), goal of therapy (68%), follow-up (68%), and frequency of cycles (55%). However, more than 50% of patients showed disagreement with the physicians' responses for duration of therapy (68%) and chemotherapy toxicities (78%). In addition, patients were expecting shorter treatment duration (55%), and 22% of patients were not able to recall any of the chemotherapy toxicities that were discussed in the informed consent. Statistically significant association was found between patient–physician agreement and patient's educational level ( $\chi^2(2)=17.73, p<0.001$ ) and previous family history of cancers ( $\chi^2(1)=15.88, p<0.001$ ). A binary logistic regression model was developed to assess the extent to which these two variables, as well as age of patients and their treating physicians, affected patient–physician discordance ( $\chi^2(5)=32.64, p<0.001$ ). It showed that patients with college or advanced degree were more likely to have full agreement with their physicians (odds ratio [OR] 10.2, 95% CI 1.127–92.448). Also, patients with positive family history for a malignancy were more likely to agree with their treating physicians on all aspects of their management plan (OR 5.295, 95% CI 1.1744–16.080).

## Conclusion

The majority of patients showed suboptimal understanding of aspects of their chemotherapy plan. Patient understanding tends to be ten times better with higher educational background and five times better with positive family history of cancers. We recommend a self-filled evaluation form of understanding of chemotherapy plans to be added as a part of the informed consent process to objectively assess of how much a patient understands.

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# Examining women’s perceptions of maternity care in public and private sectors of National Guard Hospitals in Saudi Arabia: a qualitative study

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## Background

High-quality maternity care dramatically reduces infant and maternal morbidity and mortality. Patient satisfaction is an important indicator of the quality of care because it demonstrates the difference between what the patient expects and the current level of care received. Vision 2030 represents a blueprint for Saudi Arabia’s future that is focused on improving the quality of healthcare through privatization. In support of that vision, Saudi women gained back the majority of their rights including autonomy to make their own healthcare decisions. While some research has elucidated women’s satisfaction with their maternity care within the public sector, none has examined it within the private sector or compared it across sectors. With transformation towards Vision 2030 underway, this study is designed to measure and compare women’s satisfaction with their labor and delivery care in the public and private sectors of two National Guard hospitals in Jeddah and Riyadh.

## Methods

A convenience sample of 80 women across the public and private sectors of National Guard hospitals in Jeddah and Riyadh were recruited. Participants consented to the study and completed 20-minute, face-to-face, semi-structured interviews. All interviews were recorded, transcribed, and coded. Codes were analyzed using grounded theory to build a conceptual framework regarding women’s satisfaction with their labor and delivery care across sectors and locations. Frameworks were compared to draw distinctions in perceptions across sectors and locations.

## Results

Preliminary results reveal that women within the public sector feel less satisfied with their care compared with women in the private sector because of lack of privacy and nurses’ less-careful attention to their concerns. Women within the private sector did not face those issues and also expressed great doctor–patient relationships.

## Conclusion

Women within the private sectors of National Guard hospitals feel more satisfied with care, particularly when it comes to privacy and the care provided by nurses. As Saudi Arabia transitions to privatization, careful attention should be paid to how women within the public sector are transitioned during the privatization efforts. Specifically, attention should be given to the privacy that women receive during labor and delivery, as well as how women are cared for by nursing staff. How to maintain the level of the care provided in the private sector of hospitals while expanding care to meet the needs of all women given finite resources is a direction for future research.

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# Assessing physicians' compliance with medication-related clinical decision support alerts in the intensive care unit

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## Background

The clinical decision support system (CDSS) is the centerpiece of the electronic health record (EHR) incentive program to enhance patient care and prevent medication errors. Recent studies suggested that medication-related CDS alerts were commonly inappropriately overridden and rate of adherence was usually low. The rate of medication errors for patients admitted to the intensive care unit (ICU) is higher than that for other patients and inappropriately overridden alerts may affect patient care. The aim of this study was to evaluate the embedded CDS alerts and assess physicians' compliance with medication-related CDS alerts in the ICU, by measuring the appropriateness of interruptive overrides of major severity alerts.

## Methods

This retrospective study was done by chart review of adults admitted to ICUs between January 2017 and December 2017 at a tertiary-care institution. The numbers and types of medication-related CDS alerts in adult ICUs were determined and physicians' compliance with the alerts was assessed by measuring the appropriateness of the level 1 interruptive overrides.

## Results

A total of 42,883 CDA alerts were fired in the adult ICUs: 7.5% of alerts were severity level 1 (indicates a major severity alert), 20.70% were level 2 (indicates a moderate severity alert); and 71.8% were level 3 (indicates a minor severity alert). A total of 3200 overridden major severity alters (level 1) were included for evaluation of physician compliance. An overall appropriateness rate for overridden alerts was 49.9% and the significance varied by alert category (drug allergy: 66.7%; drug-drug interactions: 59.7%; drug disease: 55.4%; drug dose screening: 29%).

## Conclusion

Almost more than 80% of the CDS alerts were warned of potential significance in patient harm and others had little clinical impact. However, almost 50.1% were inappropriately overridden and further efforts modification should be focused to improve the CDS alert system, and an uninformative alert must turn off. A future investigation is important to assess why physicians have a low adherence rate for following the recommendations of CDS alerts.

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# Incidence and clinical significance of cytomegalovirus viremia as a cause of prolonged febrile neutropenia among pediatric oncology non-stem cell transplant patients

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## Background

Cytomegalovirus (CMV) is a rare cause of prolonged febrile neutropenia (PFN) among pediatric oncology patients, especially those with non-stem cell transplant hematological malignancies. As per the Infectious Diseases Society of America (IDSA) guidelines, neutropenia is not considered as an indication of CMV reactivation, and thus preventive strategies are not needed; however, multiple studies in the literature pressed on the need to treat CMV viremia in patients with FN even when there is no evidence of end-organ involvement. Therefore, this study aimed to prospectively investigate the significance of CMV as a cause of PFN among non-stem cell transplant pediatric oncology patients.

## Methods

This was a prospective cohort study that was done at Princess Norah Oncology Center (PNOC), King Abdulaziz Medical City (KAMC) in Jeddah, Saudi Arabia. CMV viral load was monitored weekly once the individual was identified as a case of prolonged fever neutropenia until resolution. Participants and treating physicians were blinded to CMV viral load results.

## Results

Data for 27 FN episodes (48% male) were analysed. The incidence of CMV viremia was reported as 29.6%. Patients with positive CMV viremia and patients with negative CMV viremia had a similar rate of spontaneous resolution of FN ( $p=0.669$ ), and the overall mortality was reported as 105 and 125 per 1000 FN episodes, respectively. No patients received anti-CMV medication in the positive CMV group; however, one patient did in the CMV negative group, for reasons other than CMV infection.

## Conclusion

This study demonstrated that CMV viremia was not a significant factor of PFN in pediatric oncology non-stem cell transplant patients. CMV also had no significant role in terms of survival and severity of the PFN episode, which is concordant with IDSA guidelines.



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# Incidence of ventilator-associated pneumonia (VAP) in a tertiary-care center: comparison between the pre- and post-VAP prevention bundle

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## Background

Ventilator-associated pneumonia (VAP) is a nosocomial infection that develops 48 hours after the initiation of mechanical ventilatory support. Current evidence-based guidelines demonstrate that VAP prevention is feasible through the simultaneous implementation of certain VAP prevention bundle interventions. In this study we aimed to investigate the effect of VAP prevention before and after implementation.

## Methods

This was a single-center cohort study that took place at the Pediatric Intensive Care Unit (PICU) of King Abdulaziz Medical City (KAMC), Jeddah, Saudi Arabia, from March 2015 to March 2018, and assessed the rate of VAP before and after implementation of the bundle.

## Results

The study included 141 children, of whom 95 were included in the pre-bundle group and 36 in the bundle group. VAP developed in 35% of the pre-bundle group compared with 31% of the bundle group, with incidence rates of 18 and 12 per 1000 ventilator-days, respectively. Multivariate logistic regression found that high positive end-expiratory pressure (PEEP), high fever (more than 38 °C), and high white blood cell count were significant indicators of VAP in our patient population.

## Conclusion

This study found that the VAP bundle did not significantly reduce VAP rate in the PICU. Further large prospective multicenter studies with longer duration of intervention are needed to investigate the benefits of VAP prevention bundle use.

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# Prevalence and factors associated with non-urgent visits to the emergency department in King Abdulaziz Medical City, Jeddah, 2018

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## Background

Overcrowding in emergency departments as a result of non-emergency cases is a major problem faced by hospitals in most countries, including Saudi Arabia. Previous data from Saudi Arabia showed 40-50% of emergency department visits were non-urgent. This study aimed to estimate the prevalence and factors associated with non-urgent visits to the emergency department of King Abdulaziz Medical City (KAMC), Jeddah, Saudi Arabia.

## Methods

A cross-sectional study was done from April to August 2018 at the emergency department of King Abdulaziz Medical City, Jeddah. Data were collected on patients' demographics, reasons for visiting the emergency department, investigations and treatment provided, and outcome (admission, discharge with/without treatment, or discharge against medical advice). Non-urgent visits were classified based on the Canadian Triage and Acuity Scale (CTAS).

## Results

A total of 400 patients were interviewed during the study period, of whom 54.9% were female. Mean age was 50.2 (SD 19.7) years. Non-urgent visits accounted for an estimated 78.4% of visits. The main reasons for visiting the emergency department instead of the primary healthcare center, as reported by the patients, were urgent condition (41.9%), easier accessibility (25.4%), limited resources and services in the primary healthcare center (17.7%), difficulty getting an appointment (11.7%), and long waiting period (4.7%). Diabetes and hypertension represented 35.9% each, cardiovascular diseases 14.5%, cancer 12.7%, and asthma 10.2%. Imaging was performed in 54.6% of patients (57.5% of which were chest x-rays), laboratory investigations were done for 75.8% (85.2% basic screening, 79.2% complete blood count, 51.3% troponin), and procedures were done for 7.2%.

## Conclusion

The current data show over-utilization of the emergency department. Enhancement of primary care services and community awareness are important components for appropriate utilization of the emergency department.

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# Antimicrobial appropriateness evaluation based on a prospective audit and feedback service led by the Antimicrobial Stewardship Program at King Abdulaziz Medical City - Western Region

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## Background

The Antimicrobial Stewardship Program (ASP) at King Abdulaziz Medical City - Western Region (KAMC-WR), initiated in November 2016, aims to improve the use of antimicrobials at our facility. It is internationally recognized that one of the cornerstones of ASP is prospective audit and feedback (PAF). In an effort to improve antimicrobial use in areas at high risk for antimicrobial resistance, the ASP initiated a PAF service in February 2018 at the pediatric intensive care unit (ICU), pediatric cardiac ICU, adult ICU, and adult hematology-oncology ward. This retrospective study describes PAF interventions and antimicrobial appropriateness based on PAF.

## Methods

An automatically generated daily antimicrobial report built by the ASP and ISD team is used by the PAF to assess patients not under infectious disease (ID) consultation on prespecified antimicrobials for appropriateness of indication, dose, route, and frequency. The PAF service is run by the PICU or ASP/ID clinical pharmacist, ID fellow, and ID consultant. The PAF teams meet with the respective departments for discussion and communication of recommendations twice weekly for pediatric patients and daily for adults. A customized PAF electronic note is filled for each order. The audited antimicrobials are imipenem, meropenem, colistin, tigecycline, linezolid, vancomycin IV, anidulafungin, caspofungin, and voriconazole. An electronic report of the PAF note is generated regularly by the ISD team to assess PAF. Simple descriptive statistics were used for the analysis.

## Results

A total of 747 PAF consultations were documented from February 2018 to February 2019, 92% of which were in adults (686 of 747). 35% of all consultations were inappropriate. Of the 259 inappropriate medication orders, most were in adults (97%) with pneumonia (40%) and sepsis (27%). 68% of inappropriate orders were empiric, and the rest had no clear indication or were therapeutic. The most common inappropriate element of adult orders was choice of antimicrobial, followed by dose, frequency, and then route (83%, 6%, 4%, and 1%, respectively). All inappropriate pediatric orders were inappropriate choices. For adults, meropenem and vancomycin consisted of 67% of inappropriate choices of antimicrobial (140 of 208). Of all antimicrobials, tigecycline had the highest rate of inappropriate choice (10 of 21).

## Conclusion

This study shows that antimicrobial use guidelines for meropenem, vancomycin, and tigecycline need to be re-evaluated and reinforced through continuous PAF and the creation of clinical practice guidelines with electronic order sets for pneumonia and sepsis. The results of this workflow embedded electronic assessment will help the ASP at KAMC-WR tailor future interventions that promote safe and effective antimicrobial use.

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# Dental protocol of care for pediatric oncology patients at King Abdulaziz Medical City - Jeddah

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## Background

Pediatric patients undergoing cancer therapy commonly have impaired immune function and poor oral health. The American Academy of Pediatric Dentistry (AAPD) recommends examining the oral health of patients with cancer before they start chemotherapy to minimize complications. Studies have reported that children who have routine dental care before cancer treatment report fewer complications overall. The aim of this study was to describe the referral protocol from the oncology center to pediatric dental care at KAMC-Jed.

## Methods

This was a cross-sectional retrospective chart review of 155 medical records reported in the dental department for pediatric oncology patients seen in the 2-year period from 2015 to 2017. 105 cases were included while 50 cases were excluded due to wrong number and wrong diagnoses. After IRB approval, collected data were transferred into SPSS version 24 for analysis.

## Results

At KAMC-Jed, the majority of pediatric oncology patients referred to dental care were male, aged 6 years or younger, and diagnosed with hematological cancer. 80% of pediatric oncology patients were referred during chemotherapy treatment and only 3% were referred pre-chemotherapy. Patients waited for more than 1 year to be referred for dental care and 2.5 months to accomplish the dental treatment. Dental treatment was done mostly under general anesthesia (48%). Dental treatment included restorations and filling in 60% of cases and extraction in only 6% of cases. The mean number of treated teeth was  $10.89 \pm 5.25$ , with very low pulp therapy treatment.

## Conclusion

This study concluded that the oncology and dental team should collaborate to improve early assessment of pediatric oncology patients at KAMC-Jed.

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# Patient satisfaction with family physicians' lead telephone consultations for medical follow-up and dealing with minor health issues

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## Background

An audit of the family medicine clinics within the Medical Protocol Department of King Abdulaziz Medical City (MPD KAMC) showed that a large number of patients were attending for chronic condition review, refill medications, and to review their test results. 30% of the appointments were not attended by patients, which led to wastage of resources and increased demand on the remaining clinic slots. Family physicians are the gatekeepers for most health services. As such, there is an ever-increasing demand for clinic appointments. At MPD KAMC, the demand for appointments was very high due to staff shortages. At MPD, face-to-face consultations were the mainstay of looking after patients. This project was the first time the concept of telephone consultation was introduced to family physicians as an alternative and complementary modality for dealing with less urgent issues, thus creating more clinic slots. Understandably, because this was a novel concept to the department, it caused trepidation and apprehension among clinicians and allied staff. To get the idea accepted and off the ground, we introduced the principles of telephone consultation to the family physicians and arranged training sessions including role-play and difficult consultation sessions, updating the electronic records, and safety netting. To reassure staff during the initial trial period and minimize teething problems, the staff were given the option of bringing the patient back for a face-to-face consultation clinic when uncertain.

## Methods

The telephone consultation quality improvement project was designed using the Institute for Healthcare Improvement principles. Once the telephone consultation system was well established, patient feedback was sought to evaluate and improve the service. A patient satisfaction questionnaire was designed that examined different aspects of patient care. Four domains were evaluated, namely general satisfaction, professional care, depth of relationship, and perceived time.

## Results

116 patients were chosen at random to complete the anonymous questionnaire. There was a free comment box for patients to express their views openly. The results were overwhelmingly positive. The general satisfaction domain was rated as excellent by 93% of the patients while 87% of the patients rated the professional care as excellent. In the free comment box, patients complimented the new service and expressed their wishes for it to expand to include other disciplines.

## Conclusion

Telephone consultations have proved to be a viable, convenient, safe, and effective way of following up medical problems, issuing repeat prescriptions, relaying investigation results, and reminding patients of their appointments.

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# Bridging the planning execution gap in Royal Commission Health Services Program Yanbu (RCHSPY)

**Mr Ammar Ashari, Dr Mahmoud Radwhan, Dr Fuad Alshoabi**

Planning Section/Quality Management and Planning Department  
Royal Commission Health Services Program

## Background

The planning-execution gap is one of the main challenges facing any organization. According to the literature, the planning-execution gap is one of the leading causes of strategic and operational plan failure. Because of the complexity of healthcare, planning is more challenging. Inspired by Saudi Vision 2030 and guided by the National Transformation Program 2020, Royal Commission Health Services Program Yanbu (RCHSPY) made its Strategic and Operational Plan 2017-2020. The planning section identified the planning-execution gap as one of the main challenges impeding the progress of RCHSPY plans. This gap can result from many causes, such as ineffective communication, lack of measures and feedback, lack of collaboration, and weak alignment between strategic and operational plans. The planning section tried to study the gap by assessing the existing status and identifying the root causes in RCHSPY, then applying several tools and techniques in order to overcome this gap.

## Methods

RCHSPY aims to evaluate the involvement and awareness of all staff, particularly front liners and junior staff, about strategic and operational plans to ensure that they are fully oriented about the direction of the RCHSPY and that they feel their daily work is aligned with the direction of the RCHPSY strategic and operational plan. Surveys were carried out to assess the planning effectiveness and the planning-execution gap. The surveys asked staff about orientation, active participation, alignment, collaboration, and understanding of the initiatives and key performance indicators (KPIs). The survey results were supported by the analysis of 2017 and 2018 operational plan outcomes, as some significant findings have been observed.

## Results

The survey results showed that 50% of staff feel unsatisfied with their orientation, 34% feel unsatisfied about their participation in RCHSPY plans, 27% feel that their daily work is not aligned with RCHPSY plans, 50% feel unsatisfied about collaboration with other departments to implement different initiatives, and 25% replied that they never discussed RCHSPY in their departments. The 2017 and 2018 operational plan analysis of stumbling projects and initiatives showed four main challenges (4C): communication, collaboration, financial and managerial constraints, and connecting departmental KPIs to RCHSPY plans, which support the survey results.

## Conclusion

More effective communication methods are greatly required, such as interactive workshops and face-to-face meetings, to enhance the involvement and empowerment of all staff in the planning process. Feedback should be delivered to all concerned stakeholders in the form of quarterly reports and KPI results should be discussed at all levels, particularly at the departmental level. Future studies about the planning-execution gap should be done to monitor progress.

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# The successful journey of the first A2LA ISO 15189:2012 medical laboratory in the Kingdom of Saudi Arabia

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## Background

The aim was to improve the overall quality management system for the Department of Pathology and Laboratory Medicine by attaining international accreditation to A2LA ISO 15189, in order to provide accurate, reliable, and timely results for excellent patient care and patient safety. The accreditation of laboratory medicine improves all processes in the laboratory, including reduction of errors in the pre-analytical, analytical, and post-analytical processes, facilitation of accurate and rapid diagnostics, participation in acceleration and efficiency of treatment, and stimulation of continuous improvement; therefore, the decision was taken to aim for A2LA ISO 15189 accreditation.

## Methods

- Baseline assessment of the serology section was chosen as the model of implementation once successfully completing of all the identified gaps from the ISO 15189 standard.
- Development of project management action plan and agreed upon timeline:
  - Accreditation Project Initiation 2015
  - Accreditation Project Identification and Planning 2015-2016
  - Accreditation Project Execution 2016-2017
- The ISO 15189 parameters were applied to the serology section and monitored by use of key performance indicators (KPIs).
  - Accreditation Project control 2017
- The control was through performing internal audits and then taking corrective action with preventive action.
  - Accreditation Project Closeout 2018
- The project was submitted for application to the American Association for Laboratory Accreditation ISO 15189.

## Results

Internal audits were performed from the baseline audit in 2015 to the final exit audit in 2018. The results for all the sections were as follows:

Chemistry: 2015 - 20%; 2016 - 40%; 2017 - 46%; 2018 - 95%.  
Hematology: 2015 - 51%; 2016 - 60%; 2017 - 62%; 2018 - 91%.  
Microbiology: 2015 - 19%; 2016 - 40%; 2017 - 46%; 2018 - 85%.  
Serology: 2015 - 52%; 2016 - 65%; 2017 - 83%; 2018 - 95%.  
Receiving OPD: 2015 - 39%; 2016 - 52%; 2017 - 70%; 2018 - 90%.  
Blood bank: 2015 - 20%; 2016 - 50%; 2017 - 70%; 2018 - 83%.  
Molecular biology: 2016 - 20%; 2017 - 60%; 2018 - 85%.  
Histopathology: 2015 - 15%; 2016 - 30%; 2017 - 60%; 2018 - 89%.

From the results, between 2016 and 2018, a dramatic increase in compliance was demonstrated, and therefore preparation for the final A2LA ISO 15189 audit was executed.

## Conclusion

An essential component of successful implementation of A2LA ISO 15189 was the coordination and rapport between management and staff. Well-trained and well-motivated laboratory staff were required to implement the system. The initial gap analysis and then the continuous monitoring through internal and external assessment provided invaluable tools for the successful accreditation to ISO 15189:2012 for more than 250 tests. The Department of Pathology and Laboratory Medicine was the first laboratory in KSA to gain the A2LA ISO 15189 accreditation.

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# Application of infection control recommendations in the outpatient setting

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## Background

Application of infection control recommendations in the outpatient setting is one of many challenges faced due to the transition of service from inpatient to outpatient care, for which the delivery of infection control recommendations varies in understanding and implementation. At King Abdulaziz Medical City Jeddah (KAMC-JD), over the past years we have observed a significant increase in the number of infectious patients that missed the opportunities of follow-up with our basic infection control recommendations. Such patients were not followed up for the rescreening process. The majority of those patients had multidrug-resistant organisms (MDROs) and some had other types of infectious diseases. Prompt notification to the outpatient department regarding the precautions required and the rescreening process greatly facilitates the early identification of patients, resulting in timely application of infection control recommendations including the discontinuation of isolation and following the rescreening procedures, particularly for patients who are colonized or infected with MDROs.

## Methods

Infection control practitioners (ICPs) in charge of the three outpatient clinics, the ambulatory care center (ACC), King Faisal Cardiac Center (KFCC), and Oncology Outpatient clinic, monitored the outpatient appointments of patients discharged from January through December 2018.

## Results

A total of 441 appointments were monitored from January to December 2018. Of these, 392 (89%) were patients with MDROs, 49 (11%) were patients with non-MDRO infections, including tuberculosis, *Clostridium difficile*, and salmonellosis. There were 313 patient appointments in ACC. Of these, 60 (19%) patients were cleared and deflagged. There were 43 patient appointments in KFCC. Of these, 17 (39.5%) were cleared and deflagged. There were 85 patient appointments in the Oncology Outpatient clinic. Of these, 11 (13%) patients were cleared and deflagged.

## Conclusion

Our experience in monitoring infectious patients in the outpatient setting identified many gaps in the application of basic infection control recommendations. More effort is required to educate physicians and nurses about application of the related infection control practices. In addition, the cycle of communication between ICPs, nurses, and patients in the outpatient setting is yet to be established. More patients can be cleared and deflagged by more stringent implementation of the policy on screening and discontinuation of precautions for infectious patients. A dedicated ICP can bridge this gap by focusing only on the needs of very busy ambulatory care centers.



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# Development of an antimicrobial stewardship educational curriculum for nurses: the learning needs assessment

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## Background

The Antimicrobial Stewardship Program (ASP) at King Abdulaziz Medical City - Western Region (KAMC-WR) aims to improve antimicrobial use through several interventions including education of healthcare providers. Nursing represents more than a third of the health workforce at KAMC-WR. Nurses' important role in facilitating the implementation of ASP has been recognized and is supported by the literature. In developing a customized educational curriculum to reinforce the role of nursing in antimicrobial stewardship (AS), this study has been done, in collaboration with the Nursing Education Department, to assess nurses' learning needs. Although studies have examined AS knowledge, there is no empirical data regarding assessment of nurses' learning needs of AS in Saudi Arabia.

## Methods

A descriptive, cross-sectional survey of all levels of nursing staff using a learning needs assessment tool was implemented. The tool consisted of 13 questions aiming to assess nurses' perceived knowledge of antimicrobials' spectrum of activity, usage, indication, duration, adverse effects, antimicrobial resistance, Clostridium difficile infection, vaccination, antibiotic prophylaxis, and questions related to diagnostic modalities for infectious syndromes. A five-point Likert scale was used with responses ranging from "satisfied" to "dissatisfied" and "not applicable". Questionnaires were validated by circulating the survey to ten nurses with a varying number of years of experience, and assessing their responses. Validated questionnaires were handed out by the nurse managers of all 31 NGHAs departments. Simple descriptive statistics were used for data analysis.

## Results

The response rate was 43% (608 of 1411). Cardiac, oncology, and surgery departments represented most of the responses. Nurses' years of experience ranged from 0 to 32 years. The majority of nurses were SN1 and 2 (56% and 32%, respectively). Knowledge was mainly lacking in identification of patients with possible C difficile infection, prolonged antimicrobial infusion protocols, and rapid diagnostic test sampling techniques. "Neutral" was the mode for most answers of 8 of 13 questions, and the rest were "moderately satisfied". The "not applicable" category was chosen by 2-5% of responders depending on the question. This indicates that many nurses are unsure of their need for training, and that some nurses do not even identify their crucial role in AS.

## Conclusion

In this study, nurses' learning needs of AS were assessed. The results show that nursing staff are in need of professional development and training on AS concepts and their key role in ASPs. The results of this survey will help the ASP at KAMC-WR build a tailored educational curriculum that aims to improve overall patient care.

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# A quality improvement project on patient safety education in the outpatient department (OPD)

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## Background

It is an ethical responsibility of registered nurses to provide health education to their patients as part of their nursing care. However, in reality, it is often not carried out because of several reasons. As a result, a quality improvement project was done in the OPD PMBAH-MNGHA. A quality team was created, which identified the absolute lack of patient education as evidenced by a survey on nurses' documentation from 1-15 February 2017. The survey showed that among 30 patients, zero patient education was provided by nurses during the period. Furthermore, a fishbone analysis showed two primary reasons for the lack of patient education: (1) unavailability of a standard patient education tool or guidelines for nurses; and (2) inadequate training support on the use of the hospital's intranet resources. Therefore, the objective of the project is to increase patient education in outpatients by at least 50% in 12 months.

## Methods

A PDSA (plan-do-study-act) cycle was used as a framework for developing, testing, and implementing changes for improvement. The team created a standard patient safety education guidelines tool, which contains seven topics about patient safety: medication safety, hand hygiene, fall prevention, proper patient identification, pain score tool, pressure ulcer prevention, and general control of infection. Furthermore, TeamSteps principles and strategies were used during the implementation. The outcome measure of the project was the total number of documented cases of patient education while process measures were staff documentation of patient education, staff training support, and use of patient education tool. A small test of change was done from 26-30 March 2017 prior to implementation. A simple random sampling method was used for data collection.

## Results

A small test of change gained a result of 80% compliance rate. From April to December 2017 compliance was 71% and in 2018 compliance was 84%. The hospital's outpatient department has gone from zero patient education in February 2017 to a compliance rate of 84% in 2018 using the patient education guidelines tool as evidenced by nursing documentation.

## Conclusion

The project has established a quality improvement as part of ensuring the delivery of quality patient care to our clients and their families. Finally, registered nurses can perform their function as health educator to patients and their families as part of nursing care through the use of the patient safety education guidelines tool. The project can be further improved with observational study of actual patient education provided and patients' feedback.

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# Post discharge follow-up for patients infected or colonized with multidrug-resistant organisms

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## Background

The spread of multidrug-resistant organisms (MDROs) among admitted patients is one of the major threats facing many hospitals in Saudi Arabia. These organisms include methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant enterococci (VRE), and certain gram-negative bacilli (GNB). There have been increasing challenges in providing and fully implementing specific infection control strategies for affected patients during their hospital stay. Current hospital infection control guidelines recommend single rooms for every MDRO colonized or infected patient. This should be continued while patients are in hospital and upon readmission unless patients are successfully cleared. Evidence of clearance from MDRO colonization is needed before patients are considered non-infectious. Although clearance of MDRO infected and colonized patients is successfully carried out during hospital stay, a major lack of such activity has been identified after patients are discharged from hospitals. The purpose of tracing patients post discharge is to ensure that they will be screened and re-swabbed during their outpatient appointments to assess whether they no longer require extra infection control measures, such as isolation precautions, during their subsequent admission, thereby reducing the need for single rooms.

## Methods

All patients discharged with MDROs were tracked by the assigned infection control practitioner (ICP). The ICP tracked the appointments of these patients. Notification and instruction for swabbing and rescreening were delivered to responsible nurses at the outpatient department (OPD) using the OPD notification forms.

## Results

Of 271 discharged patients with MDRO infection or colonization, 38 (14%) patients were successfully cleared and deflagged from MDROs; 40 (14.7%) were not given an OPD appointment; 19 (7%) were not swabbed; 61 (22.5%) have no doctor's order; 34 (12.5%) were readmitted; 10 (3.6%) were swabbed but still yielded positive results; 11 (4%) were given very long appointment; and 9 (3%) were transferred to another facility and/or home healthcare.

## Conclusion

This exercise proved to be very tasking for any ICP to undertake. In addition, multiple challenges have been identified which require administrative support, commitment, and participation of all healthcare workers to decrease demand on isolation beds and to reduce risk of MDRO transmission.

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# Multifunctional evaluation in elderly patients hospitalized for heart disease

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## Background

Frail patients with cardiovascular disease have much higher frequencies of adverse events and complications, suggesting the need for more accurate functional stratification and careful evaluation of the risk/benefit ratio of invasive procedures. This project aimed to evaluate the prognostic impact of the Short Physical Performance Battery (SPPB) and handgrip test on the incidence of death and hospitalization for all causes in older patients hospitalized for heart disease.

## Methods

This prospective study included 283 patients aged 65 years or older, who between December 2015 and December 2017 were hospitalized for acute coronary syndrome, arrhythmias, or heart failure. Included patients were followed up after 1 year for the endpoint of all-cause mortality (ACM) and hospitalizations. All patients were evaluated for frailty using the handgrip test (using a dynamometer to measure the force of muscular contraction) and SPPB (to evaluate the functionality of the lower limbs). Chi-squared test and T-test were used to compare groups as appropriate. Univariate and multivariate logistic regression analysis was used to predict ACM.

## Results

Mean age was  $72.8 \pm 6.5$  years, 70% of patients were male, and mean BMI was  $29 \pm 5.3$ . Acute coronary syndrome 51.5%, length of stay  $7.6 \pm 7.3$  days, diabetes 74%, hypertension 79%, and dyslipidemia 60.5%. The total number of deaths was 27 (9.5%) and total admissions 45%. Charlson index in deceased participants was significantly higher than in alive participants ( $p=0.039$ , CI 0.04-1.33). Deceased participants were significantly frailer than those alive (SPPB  $p=0.006$ , CI -3.18 to -0.54). Admitted participants had higher Charlson index ( $p=0.000$ , CI 0.36-1.11) and were frailer than non-admitted participants ( $p=0.003$ , CI -1.9 to -0.38) with statistical significance. Using univariate logistic regression only to predict ACM, Charlson index  $p=0.42$ , odds ratio (OR) 1.25 (95% CI 1.01-1.57); SPPB  $p=0.008$ , OR 0.854 (0.76-0.959). With multivariate analysis SPPB predicts ACM ( $p=0.011$ , CI 0.726-0.960).

## Conclusion

Among elderly patients (older than 65 years) hospitalized for heart disease (acute coronary syndrome, arrhythmia, heart failure) and after a year of follow up, the SPPB independently predicted all study outcomes (ACM, rehospitalization, and emergency room visit). Frailty evaluation can provide a valuable pre-discharge follow-up plan that might heavily impact patient care.

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# Infection control management of Clostridium difficile infection (CDI) in an intensive care setting at King Abdulaziz Medical City/ Jeddah 2018

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## Background

Clostridium difficile is a gram-positive, anaerobic, toxin-producing bacillus that mainly causes diarrhea and colitis. A recent meta-analysis reported an overall rate of 3.54 per 10,000 patient-days per year for C difficile infection (CDI). The highest incidence was observed in intensive care units (ICUs). In the USA, C difficile caused an estimated half a million infections and 29,000 deaths in 2012. More than 80% of these deaths occurred in individuals aged 65 years or older. The approximate cost of CDI treatment in the USA was US\$ 5.4-6.3 billion per year. For the countries in the Arabian peninsula including Jordan, Kuwait, Qatar, Saudi Arabia, Egypt, and Lebanon, the prevalence rates range from 4.6% to 23.6% for CDI isolates. Saudi Arabia has the lowest rate (4.6%) among these countries. A remarkable increase in nosocomial CDI cases in the adult ICU at King Abdulaziz Medical City was observed between 18 January and 11 March 2018. The aim of our study was to decrease the incidence of CDI in adult ICUs by implementing evidence-based interventions.

## Methods

Cluster investigations were done; a time, place, and person table created, brain storming to identify the possible risk factors was evoked by the investigative team, a root cause analysis/fishbone diagram was pulled, and corrective actions were formulated.

Clinicians: hand hygiene (soap and water), use of gloves, barrier precautions, prompt identification and early treatment of CDI cases were applied.

Environmental: proper cleaning, housekeeping protocol review, and types of disinfectants used were highlighted.

Surveillance: outcome surveillance of CDI cases was added to the patient safety annual report plan.

Administration: antibiotic stewardship program (ASP), managing staff shortage, and reinforcement of the guidelines were essential.

## Results

In the first quarter, the rate of CDI was 2.1 per 1000 patient-days, which dropped to 0.9, 0.4, and 0.4 per 1000 patient-days, respectively, in the second, third, and fourth quarters of 2018.

## Conclusion

There was a significant reduction in the number of CDI cases after timely and appropriate actions were taken. However, maintaining a zero rate was challenging. Continuous monitoring, ongoing data collection, and education were considered key to reducing CDI.

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# Implementation of an oncology electronic referral system to improve access to care for children with cancer (IMPACT): a quality improvement initiative from a single center

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## Background

Delayed access to cancer care has been associated with early childhood cancer death. Improving timely access to cancer care is the first important step in the cancer treatment journey. We implemented an electronic referral system (e-RS) at the Princess Noorah Oncology Center (PNOC) to improve timely access to cancer care. This study aimed to assess the impact of implementing an e-RS on timely access to cancer care.

## Methods

This was an observational retrospective analytical cross-sectional study of 399 pediatric oncology patients selected through a consecutive non-probability sampling technique to review the turnaround time (TAT) of children with cancer diagnosed 12 months before (manual referral system) and 12 months after implementation of the e-RS.

## Results

Of the 399 pediatric oncology patients diagnosed between January 2014 and December 2015, 59.91% were male and 40.09% were female, with a median age for both sexes of 5.0 years (IQR 2.5-9.0 years). 96.3% of the patients were Saudi and 3.7% were non-Saudi. The median processing time of the manual referral system was 1075 minutes (IQR 145-1498) while the median processing time for e-RS was 125 minutes (IQR 53-1013). By applying a Mann-Whitney test of significance, the TAT between the two systems was significant ( $p=0.0001$ ).

## Conclusion

Implementing an e-RS improved referral TAT. As a result, pediatric oncology patients had improved timely access to cancer care at PNOC based on TAT standards. The impact of this improvement on outcomes will be reported separately.

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# Prevalence of hepatitis C virus infection among a population tested at King Abdulaziz Medical City, Jeddah, in 2018

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## Background

Hepatitis C virus (HCV) is one of the three major bloodborne infections. HCV infection has a devastating outcome, yet is a curable disease. The World Health Organization (WHO) targets elimination of the disease by 2030. This target cannot be achieved without screening and case detection. This retrospective study aimed to investigate the prevalence of HCV infection among people tested at King Abdulaziz Medical City, Jeddah (KAMC-J), during 2018.

## Methods

Results of the HCV antibody enzyme-linked immunosorbent assay (ELISA) tests conducted during 2018 at KAMC-J were obtained from the Electronic Medical System (BestCare). The HCV RNA test results were reviewed through the HCV surveillance database available in the Infection Prevention and Control Department. Data were also collected on demographic variables (age, sex, and nationality). Statistical analysis was done with IBM SPSS version 24.

## Results

A total of 5425 HCV antibody tests were performed in 2018. More than half of the samples were for females (54.4%, n=2953). The overall prevalence of positive HCV antibodies among the tested population was 1.5% (n=82). Reactive HCV antibodies were higher among females (1.6%, n=46) than males (1.5%, n=36). The prevalence significantly increased with age from 0.3% (n=6) among people younger than 25 years up to 6.2% (n=42) among those older than 70 years. HCV positive antibody prevalence was significantly higher among Saudi (1.8%, n=79) than non-Saudi (0.3%, n=3) populations. Of the 82 cases with positive HCV antibodies, 49 (59.8%) cases were newly diagnosed, of which 30.6% (n=15) had reactive HCV RNA. Only two people were HCV/HBV co-infected.

## Conclusion

This study demonstrates the importance of HCV screening of high-risk populations, including military personnel, and the need for early intervention in order to achieve the WHO target of eliminating the disease by 2030.

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# Pattern of influenza infection and circulating serotypes in King Abdulaziz Medical City, Jeddah, in 2018

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## Background

Influenza is a highly infectious viral illness associated with a significant burden on the healthcare system in terms of disease morbidity, hospital admission, and medication cost, in addition to working days lost. Severity of the infection varies from a self-limiting condition to severe illness and complications. Predominance of different influenza serotypes varies between seasons. Understanding the pattern of the circulating influenza serotypes is a continued public health challenge. This study aimed to investigate the pattern of influenza infection and the predominance of different serotypes during 2018 in King Abdulaziz Medical City, Jeddah.

## Results

The total number of laboratory-confirmed influenza cases in King Abdulaziz Medical City, Jeddah, during 2018 was 507. Among them, 132 (26.04%) were admitted to hospital. Infected healthcare workers accounted for 44 (8.68%), including 17 nurses and eight physicians. Positive influenza cases were reported throughout the year. During January-February, a total of 109 cases were reported, the most predominant type was influenza B, followed by influenza A non-H1N1 then H1N1. This pattern changed with fewer cases from March-September (n=97), with predominance of influenza A non-H1N1 followed by influenza B and sporadic cases of H1N1. The number of reported cases significantly increased starting from October-December for all the serotypes (n=301), with predominance of influenza A non-H1N1 followed by H1N1, then influenza B. However, continued study of cases during January-February 2019 again showed predominance of influenza B type.

## Conclusion

A changing pattern of influenza serotypes was observed as early as March and continuing to December 2018. Influenza A non-H1N1 was predominantly increased during this period. Molecular epidemiological studies are required to identify the specific circulating influenza A non-H1N1 serotypes as well as the influenza B lineages. These studies will impact the seasonal vaccine serotype matching and would enhance vaccine effectiveness.



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# Seroprevalence of hepatitis A antibodies among healthcare workers, military personnel, and patients at King Abdulaziz Medical City, Jeddah, Saudi Arabia

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## Background

Hepatitis A virus (HAV) is a common viral infection. During the past decade, age variation in hepatitis A infection and immunity has been reported worldwide with improved sanitation and vaccination. Healthcare workers and military personnel are at-risk populations and data on hepatitis A seroprevalence would reflect the exposure status and effectiveness of the immunization programs for children and adults. This study investigated the age pattern and other demographic risk factors associated with HAV antibodies among healthcare workers, military personnel, and patients at King Abdulaziz Medical City, Jeddah, during the period from April 2017 to January 2019.

## Methods

A retrospective review of HAV antibody test results was carried out. Data were obtained on HAV immunoglobulin G (IgG) and immunoglobulin M (IgM), and demographic variables including age, sex, occupation, and nationality.

## Results

A total of 3268 HAV enzyme-linked immunosorbent assay (ELISA) test results were analysed (84.8% HAV IgG, n=2770; and 15.2% HAV IgM, n=498). The prevalence of positive HAV IgG and IgM among the studied population was 31.7% (n=878) and 33.3% (n=166), respectively. The prevalence of reactive IgG and IgM increased with increasing age. Among people younger than 20 years, the reactive IgG percentage was 27.9% compared with 59.3% among those older than 40 years. The percentage of positive IgM was 22.8% among people younger than 20 years and 56.3% among those older than 40 years. Reactive IgG was significantly higher among male than female individuals; however, no difference was observed for IgM. Food handlers had the highest reactive IgG and IgM proportions (79.5% and 72.7%) followed by military personnel (46.7% and 31.3%), patients (37.2% and 38.2%), healthcare workers (27.5% and 32.5%), then medical and allied-health students (14.4% and 14.3%). The prevalence of reactive IgG and IgM was significantly higher among the non-Saudi population than the Saudi population (49.1% and 59.0% versus 28.9% and 29.7%, respectively).

## Conclusion

This study addresses the importance of strengthening HAV vaccination for children as well as adults. The majority of younger individuals were susceptible to HAV infection. All healthcare workers, military personnel, and medical and allied-health students should be tested for HAV IgG and should be vaccinated if negative. Food handlers are a specific high-risk population who should get more attention for education and vaccination against HAV infection.

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# Public awareness about the significance of inflicted head trauma in children at King Abdulaziz Medical City - Jeddah

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## Background

Inflicted head trauma (IHT) results in severe brain damage that might lead to permanent impairments. Raising public awareness of IHT may improve parents' responses towards a distressed infant. This study aims to measure the level of Saudi public awareness of IHT.

## Methods

A prospective assessment was done in King Abdulaziz Medical City in Jeddah over a couple of months. Copies of the self-administered questionnaire were distributed to participants (n=316), and results were assessed anonymously. The statistical analysis was done with SPSS software.

## Results

316 participants were included, of whom 79.7% had not heard about IHT, whereas 20.3% had heard about it. Of those who had heard about IHT, media was the most frequent source (52.5%), with others knowing about it from different sources. Almost all the participants stated that they need more information, regardless of whether they had previous knowledge (98.4%). Some of the participants believe that information about IHT should be delivered through pediatric doctors (54.7%), whereas 21.2% believe that midwife nursing is responsible; others put the responsibility upon different specialties such as public health and general physicians (24.1%).

## Conclusion

The majority of the parents had no previous knowledge of IHT, and they showed concern about knowing further information regarding this topic. Therefore, we recommend that our society needs educational programs and prevention strategies to enhance public awareness.

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# Immune status to measles, rubella, and varicella-zoster among newly recruited healthcare workers at King Abdulaziz Medical City, Jeddah, Saudi Arabia

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## Background

Measles, rubella, and varicella-zoster are vaccine-preventable diseases that have the potential of transmission in healthcare settings. Healthcare professionals are at high risk of exposure to these viral diseases and should be immunized. Screening and vaccination of newly recruited healthcare workers (HCWs) is considered a cost effective intervention. All newly recruited HCWs are required to have physical and serological assessment before they start working. Serology screening covers several vaccine-preventable diseases including measles, rubella, and varicella. This study aimed to identify the immune status to these diseases among the newly recruited HCWs at King Abdulaziz Medical City, Jeddah (KAMC-J).

## Methods

A retrospective review of the employees' medical records was conducted. Data were extracted from the electronic medical records and database of pre-employment assessment. Data were collected on demographic data (age, sex, and nationality) and IgG antibodies of measles, rubella, and varicella-zoster virus.

## Results

During the study period, 673 newly recruited HCWs were screened. The mean age was 26.5 (SD 5.5) years, and two-thirds (63%) of the participants were female. The majority of participants were immune against measles (87.3%), rubella (87.8%), and varicella (93.2%). Immunity (positive IgG) against measles, rubella, and varicella was higher in females than in males. Similarly, measles and rubella IgG was higher in older participants (older than 25 years of age); however, varicella IgG was higher among younger participants (25 years old or younger). Measles-positive IgG ranged from 78.9% to 96.9%; the lowest was among non-clinical HCWs and the highest was among nurses. Rubella-positive IgG ranged from 85.7% to 93.8%; the lowest was among allied health staff and the highest was among nurses. Varicella-positive IgG ranged from 91.2% to 95.5%, the lowest was among allied health staff and the highest was among physicians. Among the new Saudi employees, prevalence rates of IgG for measles, rubella, and varicella were 85.1%, 86.7%, and 93.1%, respectively, which were lower than those for non-Saudi HCWs.

## Conclusion

This study revealed good immunity coverage for measles, rubella, and varicella among newly recruited HCWs; however, the allied health staff and non-clinical HCWs should receive more attention to optimize their vaccination status. Immunization of new HCWs should be enhanced as an essential component of workers' protection to reduce the risk of transmission and burden on the healthcare system.

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# Hepatitis B serological status among a population screened in the Ministry of National Guard Health Affairs in Saudi Arabia between 2016 and 2018

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## Background

Hepatitis B viral infection represents a major public health problem worldwide. Despite being considered a vaccine-preventable disease, prevalence is still high in many regions. Most people are unaware that they are infected, and are frequently diagnosed during routine screening or as a work-up of advanced hepatic disease. The current study aimed to evaluate the proportion of the population currently infected, with past infection, or non-infected, and to determine the proportion of the population that is immunized.

## Methods

A retrospective descriptive study was done, reviewing the serological markers for hepatitis B requested among the population who attended the MNGHA, Jeddah. Data from people screened between 2016 and 2018 were included in this study. Serological markers for hepatitis B included hepatitis B surface antigen (HBsAg), hepatitis B core antibodies (HBcAbs), and hepatitis B surface antibodies (HBsAbs).

## Results

Among 8370 people screened for hepatitis B, 312 (3.72%) individuals were found to be infected with hepatitis B (HBsAg/HBcAb positive, or at least HBsAg positive). The majority (92.34%, n=7729) was not infected (HBsAg negative/HBcAb negative, or HBsAg negative/HBcAb positive/HBsAb positive as past infection, and HBcAb negative/HBsAb positive as immune). Serological status of infection of the remaining 3.93% was unknown (only HBsAb negative tested, or isolated core: HBcAb positive/HBsAg negative/HBsAb negative [possible occult infection], or only HBcAb positive tested). Among subjects screened for HBsAbs (n=5619), 3382 (60.19%) were immune (HBsAb >10 IU/mL). Of 4960 individuals tested for HBcAbs, 862 (17.38%) were found to be positive, exposed to hepatitis B virus (active, occult, or past infection). The majority of infected individuals were Saudi (94.6%) and 57.6% were male; however, 75% of the population screened were Saudi, with 4.66% of infection among Saudis. Regarding the population exposed to hepatitis B (HBcAbs positive tested), 22.28% were Saudis, 20.08% from the Philippines, 16.90% from Pakistan, 14.52% from Egypt, and 9.55% from India, from the most frequently exposed nationalities. Among immune people, 54.3% were Saudi and 58.5% were female.

## Conclusion

Despite the available vaccination for hepatitis B virus, more than 3% of the population screened was infected, and more than 17% had been exposed to the virus (HBcAbs positive). Screening for hepatitis B virus, early identification of infected individuals, and vaccination for the non-immune population must be encouraged.

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# Improving reporting of medication errors at Al-Wazarat Primary Healthcare Pharmacy of Prince Sultan Military Medical City (PSMMC), Riyadh, Saudi Arabia

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Pharmacy

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## Background

It has been found that around 70% of medication errors (MEs) have been corrected by pharmacists; however, the pharmacists did not report the MEs to the safety reporting system. When we analyzed the existing data, we noticed that the current reporting of MEs by pharmacists was zero, even though the benchmark for the 8-hour shift is estimated to report at least five MEs per day. Thus, we decided to develop an improvement project aiming to increase the number of MEs reported to 64 by November 2018 in Al-Wazarat Primary Healthcare Pharmacy of Prince Sultan Military Medical City (PSMMC).

## Methods

This quality improvement project was done at Al-Wazarat (Primary Healthcare Pharmacy) at PSMMC. The Quality Team (QT) has been formulated and started analyzing the reporting data available in the pharmacy department. Data showed there is a huge gap between the number of MEs corrected by pharmacists and their reporting behavior. Then the QT conducted several sessions using quality tools, such as process mapping, brainstorming, and cause-effect techniques, to explore the possible factors causing pharmacists to not report MEs. Several PDSA (plan-do-study-act) cycles were used to test ideas for change, including redesigning the ME form to simplify and standardize the reporting process of MEs. The impact of such an intervention had been assessed using the process and outcomes measures. The final results have been analyzed and presented using a run chart.

## Results

The implementation led to remarkable improvement. In November, 130 MEs had been reported by pharmacists, which exceeded our goal for ME reporting in the Al-Wazarat Primary Healthcare Pharmacy. The number of MEs reported increased from zero in October (before the intervention) to between five and ten MEs reported per day during the month of November after the intervention. Also, the percentage of pharmacists who became active in reporting MEs improved after several PDSA cycles had taken place.

## Conclusion

Simplification and standardization of the ME form has led to an increase in the reporting of MEs among primary healthcare pharmacists. However, such an intervention might not be sufficient to sustain the pharmacists' new reporting behavior without making such change a part of the pharmacy management safety system. Thus, before spreading these initiatives to another primary healthcare pharmacy, further testing among other pharmacies in a different setting is highly recommended.

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# Achieving and sustaining zero CLABSI events in oncology patients by implementing targeted interventions

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## Background

Central line–associated bloodstream infections (CLABSIs) are one of the potentially life-threatening complications that occur in patients with cancer. Central lines are usually required in these patients for prolonged durations. The purpose of this study was to identify and implement multiple interventions for the prevention of CLABSIs in patients with cancer.

## Methods

A multidisciplinary taskforce was created to identify and implement evidence-based interventions to achieve a target of zero CLABSI in both adult and pediatric oncology patients. Monitoring of CLABSI and central line bundle also continued as it was being done before creation of the taskforce. These interventions included mandatory educational sessions, use of a dedicated trolley for central line use only, patient and family education on care of central lines, chlorhexidine bath before insertion of central lines, review of staff competency on handling central lines, and improvement in the completion of central line bundle. These interventions were introduced at three levels of line management: pre-insertion, during insertion, and post-insertion of central lines. Data were collected on a daily basis with analysis and reporting on a quarterly basis.

## Results

In adult patients, the quarterly rate of CLABSI in the four quarters of 2017 was 1.9, 1.9, 1.3, and 2.1 per 1000 central line days, respectively. The overall annual rate in the year 2017 was 1.8 per 1000 central line days with a total of seven CLABSI events and 3875 central line days. For pediatric patients, the quarterly rate of CLABSI in the four quarters of 2017 was 1.3, 1.2, 1.2, and 1.1 per 1000 central line days, respectively. The overall annual rate in the year 2017 was 1.2 per 1000 central line days with a total of eight CLABSI events and 6638 central line days. As a result of the interventions, no CLABSI events were observed in either adult or pediatric patients in the first two quarters of 2018.

## Conclusion

A collaborative effort by the dedicated multidisciplinary team resulted in achieving zero CLABSI. The targeted interventions resulted in achieving the ultimate goal of zero CLABSI and sustaining it for 6 months in high-risk oncology patients.

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# Risk factors for acquisition of multidrug-resistant gram-negative bacteria in a tertiary care hospital in Saudi Arabia: a case-control study

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## Background

The increase in incidence of multidrug-resistant (MDR) organisms, especially gram-negative bacteria, in healthcare facilities is a serious cause of concern worldwide. This study was done at King Abdulaziz Medical City, Jeddah, a tertiary care hospital. The World Health Organization has published a priority pathogens list of antibiotic-resistant bacteria. The priority pathogens have been categorized into three major priorities (i.e., critical, high, and medium). The critical priority pathogens include common gram-negative bacteria (GNB) such as carbapenem-resistant *Acinetobacter baumannii*, carbapenem-resistant *Pseudomonas aeruginosa*, and carbapenem-resistant and third-generation cephalosporin-resistant Enterobacteriaceae such as *Klebsiella pneumoniae* and *Escherichia coli*. The current study identified risk factors for the acquisition of these MDR gram-negative critical priority pathogens in King Abdulaziz Medical City, Jeddah, to inform strategies for their containment.

## Methods

A case-control study was carried out from January to April 2015, in which 100 patients with healthcare-associated infections (infections arising 48 hours after admission) caused by MDR GNB were compared with two control groups, i.e., 100 patients with healthcare-associated infections caused by non-MDR GNB (not meeting the criteria of MDR) and 100 patients without infection caused by GNB. MDR bacteria were defined as bacteria that were non-susceptible to at least one antibiotic in three or more classes of antibiotics. Data were analyzed using descriptive statistics (frequency and percentage of categorical variables). Multivariate regression analysis was undertaken to identify significant predictors of MDR GNB. Odds ratios (ORs) with 95% CIs were calculated and the level of significance was determined as  $p < 0.05$ .

## Results

A total of 388 organisms were isolated during the study period from 332 patients. 56 (14%) patients were infected with more than one organism. Antibiotic therapy (OR 5.50, 95% CI 2.19-13.84; OR 3.98, 95% CI 1.68-9.44), stay in intensive care unit (OR 11.11, 95% CI 4.58-26.93; OR 8.60, 95% CI 3.28-22.57), and having indwelling medical devices (OR 3.02, 95% CI 1.45-6.33; OR 2.43, 95% CI 1.11-5.33) were the significant risk factors in patients infected with MDR GNB compared with each of the other two control groups, respectively.

## Conclusion

The risk factors identified in our study provide guidance for healthcare workers for the prevention and containment of MDR GNB with special emphasis on effective implementation of an antimicrobial stewardship program and enhancing infection control practices in intensive care units.

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# Baseline assessment of patient safety culture in public hospitals in Kuwait

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## Background

Patient safety culture reflects the values that members of the organization share regarding what is important, how things operate, and how inter-departmental interactions, structures, and systems are collectively manifested in behavioral norms that support patient safety. Conducting an assessment of patient safety culture in hospitals is only the first step in defining and refining a solid safety culture. This allows healthcare organizations to develop a clearer view of areas where they need to focus their attention as part of their efforts to strengthen patient safety culture. This study aimed to assess patient safety culture in public hospitals in Kuwait as perceived by hospital staff and compared the results with those of similar regional and international studies. Furthermore, the study explored the association between patient safety culture predictors and outcomes, taking into consideration respondent characteristics.

## Methods

This cross-sectional study used the Hospital Survey on Patient Safety Culture (HSOPSC) developed by the Agency for Healthcare Research and Quality. The survey covered 16 public hospitals in Kuwait and targeted selected hospital staff including physicians, nurses, pharmacy and laboratory staff, dietary and radiology staff, supervisors, and hospital managers.

## Results

A total of 12,871 employees from 16 public hospitals in Kuwait completed the patient safety culture survey. The overall response rate was 60.5%. The majority of the sampled respondents were female (71.4%) and most were found to hold a university level degree (72.3%). Most of the sampled respondents were found to be nurses (66.8%). The dimensions with the highest positive score and thus considered areas of strength were teamwork within units (89.7%), organizational learning - continuous improvement (86.1%), management support for patient safety (77.8%), supervisor/manager expectations and actions promoting patient safety (77.1%), and feedback and communication about error (70.7%). The remaining seven dimensions can be considered areas requiring improvement. The results were compared to the US, Lebanon, and KSA benchmarks. When compared with KSA, Kuwait results were at or better than the benchmark for nine of the composites. However, none of the composites were found to be worse than the US, Lebanon, or KSA.

## Conclusion

This is the first large-scale study to assess patient safety culture in public hospitals in Kuwait. Study findings can guide country-level strategies to further improve the systems governing patient safety practices. Comparing findings to the performance of other countries in the region can help hospitals.



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# The effectiveness of sterile technique in reducing false-positive blood culture results in Qatif Central Hospital Emergency Department

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## Background

Blood culture contamination is a common and preventable problem in the emergency department (ED). In previous studies, changing the process of ED blood culture collection into a more sterilized procedure resulted in a substantial reduction in the rate of blood contamination. The present study assessed the degree of blood contamination and evaluated the effect of using a sterile technique with monitoring and feedback on contamination rate over a 1-year period.

## Methods

We documented the rate of blood contamination among blood samples sent from the ED in the period from January 2016 until March 2016. A workshop for all ED nurses was held in March 2016 by clinical nurse instructors and this was followed by daily bedside teaching sessions for the whole study period. Nurses were instructed and audited on proper sterile blood withdrawal techniques. During the intervention period, we measured the rate of blood contamination for the period from April 2016 until September 2016.

## Results

Our average contamination rate dropped from the baseline of 12.6% (58 out of a total of 736 samples) to an average contamination rate of approximately 5.6% (122 out of a total of 1549 samples), with an odds ratio of 0.411 (95% CI 0.303-0.559;  $p < 0.001$ ).

## Conclusion

Changing the method of blood culture collection from the commonly used aseptic technique to a sterile process resulted in significant reductions in blood culture contamination in a busy community hospital ER. Monitoring the implementation process was important to identify and overcome operational challenges. In addition, this study could be a good initiative to start a multicentric quality improvement project to reduce blood contamination in the neighboring community and public hospitals.

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# Medication Exchange and Sharing Network Program (MESNP) initiative to cope with drug shortages in the Kingdom of Saudi Arabia (KSA)

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## Background

Drug shortages are a major public health concern and remain a persistent problem worldwide. Saudi Arabia is one of the richest and fastest growing countries in the Middle East. Despite that, Saudi Arabian drug markets are not immune to drug shortages. Although exact figures about drug shortages in Middle Eastern countries in general and in Saudi Arabia, in particular, are lacking, there is an emerging yet still limited number of reports about the drug shortage. It is, however, a fact that the drug shortages are affecting the Middle East in general and the Kingdom of Saudi Arabia (KSA) in particular. At the time we conducted this project, the Saudi Food and Drug Administration (SFDA) had not yet fully activated and implemented its role in tracking drug shortages and the role of other regulatory bodies were either outdated or unknown. Healthcare is one of the main focus areas of Saudi Vision 2030, which represents a comprehensive plan for the entire economic structure of Saudi Arabia. In order to ensure the Saudi Vision 2030 becomes reality, we should focus on more efficient use of our current resources. Based on that, we identified an innovative solution at the national level to collaborate and cope with the current situation by developing a centralized Medication Exchange and Sharing Network Program (MESNP).

## Methods

A quality improvement process map method was used for this project. Baseline evaluation included a review of possible reasons and strategies to manage medication shortages, recognize potential associated safety issues, and we developed MESNP as a national novel project to cope with medication shortages using a telegram as the preferred social media platform for group creation and communication.

## Results

A total of 500 reports were received. The majority of reports (70%) were raised by the Ministry of Health (MOH). A number of reports constituted requests for drug supplies due to shortages (n=315) and reports indicating the availability of overstock items for redistribution (n=185). Almost 98% of overstocking drug reports were redistributed, which covered 75% of drug shortage requests.

## Conclusion

We believe that this is the first national novel project aiming to address drug shortages. The optimistic findings of this project were the proactive identification of data and development of a framework to collect data about national drug shortages to facilitate the medication exchange and sharing between organizations to prevent drug wastages and shortages for better patient care.

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# Identification of the incidence of adverse drug reactions (ADRs) using naloxone as a trigger tool: a retrospective analysis

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## Background

Adverse drug reactions (ADRs) adversely affect patient outcomes, which may cause patients to lose confidence in the healthcare system. Even with the drastic improvement in healthcare practices, detection of ADRs continues to be an important safety tool to ensure patient treatment outcome and safety. The Institute for Healthcare Improvement (IHI) developed a trigger tool as a method to identify possible adverse events from medicine use in the inpatient setting. In this context, we identify naloxone as a trigger tool to detect unreported adverse effects secondary to the use of medicine.

## Methods

A retrospective chart review of naloxone prescribed to all admitted patients at KAMC-J over 1 year (2016 to 2017) was done to assess the trigger tool efficacy in the identification of ADRs and to assess the appropriate use of naloxone. We defined the appropriate use of naloxone as documentation of the reason for ordering being present and appropriate. The other objective was to determine the proportion of incidents documented through the safety reporting system (SRS).

## Results

A total of 100 patients who received naloxone orders were identified, for which all were administered in the inpatient setting. The majority of naloxone orders (n=62, 62%) were to reverse mental status changes, while six patients (6%) required intensive care admission. Only four (4%) cases out of 100 had a documented ADR report through the SRS. The most commonly prescribed dose of naloxone was 0.4 mg (56%) followed by 0.2 mg (23%). Only two patients received a higher initial dose of 2 mg. The majority were prescribed secondary to morphine (IV) or fentanyl (IV or patch), or hydromorphone (PO in patient with end-stage renal disease), and three patients received naloxone secondary to benzodiazepine administration. Two geriatric patients received naloxone without clear justification and they were not on any opioid drugs. The rest of the patients received various doses (0.04 to 1.2 mg).

## Conclusion

Using naloxone as a trigger tool is effective in tracing and tackling ADRs in our institution. We found that naloxone administration was often inappropriate. The most common order for naloxone was a 0.4 mg IV push dose, which caused a reversal of analgesia. Development of guidelines and order sets defining the appropriate use of naloxone will help guide healthcare providers on the appropriate ordering of naloxone based on the clinical situation. Although serious ADR reports are minimal in our data (6%), it did not eliminate the chance of missing important serious reports due to under-reporting.

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# Implementing large-scale change of quality culture: Abu Dhabi story

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## Background

The Department of Health - Abu Dhabi (DoH) is the responsible organization that ensures high-quality, sustainable, and accessible care to a population of about 3 million. Improving the quality of care and enhancing patient experience are the top strategic priorities for the DoH and for Abu Dhabi Vision 2020. However, a quality framework had not been put in place to monitor the performance of healthcare providers and measure the quality levels. Moreover, there were variations in the clinical outcomes among the peer group of providers, which affected the patient experience. In order to improve the quality of care and patient experience, DoH introduced Abu Dhabi Quality Index in 2014, a comprehensive quality monitoring framework that is based on the latest thinking and innovative solutions that allows for continuous quality improvements. It consists of Jawda (quality in Arabic) indicators, patient experience survey, and healthcare professional satisfaction survey.

## Methods

To implement a wide scale of quality change, the DoH developed and implemented a quality improvement framework to enhance quality culture at system level, improve patient safety at the population level, and reduce quality outcome variation among all healthcare providers. This was achieved through a set of quality indicators, Jawda indicators, that measure clinical outcomes, patient safety, and accessibility. The initiation of what to focus on and the vision was around patients' complaints analysis, workshops with stakeholders, and one-to-one meetings. This was a key driving case for change.

## Results

The latest data collected from 45 hospitals in Abu Dhabi have shown the following results:

- 20% reduction in unplanned readmission rate for pneumonia.
- 50% reduction in cardiopulmonary arrest outside critical care.
- 40% reduction in rate of falls resulting in any injury.
- 30% reduction in hospital-acquired or worsening pressure ulcer rate.
- 50% reduction in emergency primary cesarean section rate.
- 40% reduction in surgical site infection rate for emergency cesarean section.

## Conclusion

It has been 4 years since the introduction of Jawda indicators to the health sector in Abu Dhabi, and there have been improvements on the average of quality performance and reduction in quality variation among hospitals. More importantly, quality culture, transparency, and accountability were enhanced. The latest improvements to the program include risk adjustments and clinical subspecialty indicators such as stroke, orthopedics, and bariatric surgeries. In 2019, new quality dimensions will be added to the Abu Dhabi Healthcare Quality Index and hospital rankings will be published.

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# Nebulized amphotericin B prophylaxis in immunocompromized patients to prevent invasive pulmonary aspergillosis: a systematic review and meta-analysis

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## Background

Invasive pulmonary aspergillosis (IPA) is one of the major contributing factors increasing morbidity and mortality in immunocompromized patients. Nebulized amphotericin B (AMB) has been studied as a method for prevention of IPA. However, most published studies lacked a consistent conclusion. This systematic review evaluated the efficacy and safety of prophylactic inhalation of AMB for the prevention of IPA in selected immunocompromized patients (cancer/chemotherapy, solid organ transplant lung/heart).

## Methods

An electronic database search was conducted including published and unpublished papers in MEDLINE and Cochrane databases together with international conference proceedings and bibliographies of major articles. Randomized control trials and observational studies (comparative/non-comparative) comparing nebulized AMB versus placebo were included. Two independent reviewers assessed and extracted the data from included studies.

## Results

A total of 37 studies were included in the qualitative synthesis, of which 17 were analyzed quantitatively in the meta-analysis. Incidence rates of IPA and IPA-related mortality were significantly lower with the use of prophylaxis nebulized AMB, with risk ratio (RR) 0.38 (95% CI 0.28-0.51,  $p < 0.00001$ ) and RR 0.54 (95% CI 0.33-0.91,  $p = 0.02$ ), respectively. The rates of side effects were 25% and 40% in comparative and non-comparative studies. Significant side effects promoting stopping nebulization occurred in 6.6% and 4.8%, respectively.

## Conclusion

This analysis found a significant protective effect of nebulized AMB in preventing IPA and IPA-related mortality in immunocompromized patients.

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# Association between postoperative infection and blood transfusions in cardiac surgery in King Faisal Cardiac Center, 2016 to 2019

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## Background

Blood transfusion is a commonly used therapy in cardiac surgery, whether it is given during the surgery or in the intensive care unit. Because of this alarming number, it is necessary to evaluate the risk and complications that patients are exposed to once transfusion therapy is applied. Postoperative infection in cardiac surgery patients has been linked to patient outcome. Nosocomial pneumonia, surgical site infection, mediastinitis, bacteremia, and sepsis are common infectious processes affecting the outcome. In the King Faisal Cardiac Center (KFCC), the liberal use of blood transfusions has been raising questions on the outcomes of patients. In an attempt to decrease the use of transfusions, it is essential to understand the risk and complications associated with them. Postoperative infection is the main complication that causes most concern. We aimed to determine the effects of blood transfusion on postoperative infection in cardiac surgery patients and to assess the benefits or negatives of our large transfusion rate at the KFCC from January 2017 to January 2019.

## Methods

We did a retrospective cohort study of all patients aged older than 18 years who underwent cardiac surgery at KFCC from January 2017 to January 2019. Data were analyzed using the statistical package IBM SPSS 22. Categorical variables were reported as percentages, while numerical variables were reported as means and medians. P values less than 0.05 were considered significant.

## Results

197 was the sample size. Mean age was 57.64 years and body-mass index (BMI) was 28.91. 93.4% of patients had blood transfused and 31.98% had postoperative infection. Comparing transfused and non-transfused patients, hemoglobin (Hb) on discharge values and postoperative infection were similar; only preoperative Hb was significantly different ( $p < 0.0053$ ). Comparing patients receiving 1-2 units of red blood cells (RBCs; 48%) and more than 2 units of RBCs (52%), there was also no significant difference in postoperative infection. Patients with postoperative infection had a mean HbA1c of 8.16, while non-infected patients had a mean HbA1c of 7.33.

## Conclusion

Blood transfusion was not significantly linked to postoperative infection and discharge hemoglobin. The findings show us that giving blood has not increased or decreased the risk of infection. Therefore, it is safe to say that, regarding postoperative infection and discharge Hb, we are transfusing too much blood and using up resources for outcomes that could have been achieved otherwise. Although our curiosity for the high infection rate has still not been answered completely, we assume HbA1c plays a major role because of the high prevalence of diabetes, and especially uncontrolled diabetes, in our population.

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# The effect of statin treatment on glyceimic profile

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## Background

Patients who are at risk for atherosclerotic cardiovascular diseases will start statin therapy as primary prevention to lower the low-density lipoprotein (LDL) level. However, the use of statins may induce new-onset diabetes and increase the HbA1c level. A meta-analysis of nine randomized clinical trials concluded that statins cause a modest increase in HbA1c levels by 0.12%. Different statins exert different effects. A cohort study aimed to examine the effect of different statins on the risk of new-onset diabetes, and concluded that atorvastatin, rosuvastatin, and simvastatin were associated with significantly higher risks of incident diabetes compared with pravastatin. Additionally, a randomized trial assessing the effect of high-dose statins on fasting plasma glucose (FPG) levels and HbA1c levels compared atorvastatin 80 mg with rosuvastatin 40 mg and found that atorvastatin 80 mg was associated with a significant increase in HbA1c level by 4 units. This study aimed to assess the effect of statins on HbA1c levels and to determine which statin exerts most of the effect.

## Methods

This was a subgroup analysis of a retrospective chart review study including patients who were admitted to King Abdulaziz Cardiac Center, National Guard Hospital in Riyadh, KSA, during January 2015 until September 2017. A total of 500 cases represent the sample size of the study. The inclusion criteria included adults older than 18 years who used either rosuvastatin or atorvastatin, while the exclusion criteria included patients on simvastatin, and patients who had a contraindication for high-intensity statins or who cannot tolerate them.

## Results

Our results showed the opposite to previous studies. The use of statins was not associated with a significant increase in HbA1c levels in patients with diabetes ( $p=0.870$ ). This could be because of good glyceimic control in these patients because they had already been diagnosed as diabetic patients and were on antidiabetic medications. The impact of statins on HbA1c level in non-diabetic patients demonstrated an increased level of HbA1c ( $p=0.004$ ). We identified which type of statin and which dose exerted most of the effect. Atorvastatin 80 mg and rosuvastatin 20 mg were associated with a higher rate of HbA1c disturbances in patients with diabetes only ( $p=0.000$  and  $p=0.022$ , respectively).

## Conclusion

This study along with previous studies showed that statins significantly affect the glyceimic profile in non-diabetic patients only and showed no effect in diabetic population. The effect was significant only with high intensity statins. Therefore, careful monitoring in non-diabetic statin users is warranted.

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# Using an evidence-based tool (LACE index) to review hospital readmission

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## Background

The medical literature refers to hospital readmission as common, expensive, and often preventable incidents in healthcare. Readmission within 30 days after discharge is one of the commonly implemented quality outcome measures reflecting effectiveness and efficiency that is adopted by many healthcare facilities as well as healthcare accreditation standards. It is essential to assess such cases of readmission to identify unjustified readmission that is usually avoidable so that actions can be taken to minimize such cases. Reviewing cases of readmission to differentiate between justified readmission and unjustified readmission that is usually avoidable is challenging and requires the use of evidence-based and objective tools to minimize subjectivity and to ensure accuracy of the collected data. The LACE index is an evidence-based and objective tool widely used to identify patients who are at high risk for readmission within 30 days of discharge. There is extensive literature about the predictive power and value of using the LACE index in healthcare facilities. The Royal Commission Health Services Program (RCHSP) faced a 20% increase in avoidable hospital readmission in 2017 compared with 2016. The LACE index was an important tool adopted to review hospital readmission to identify unpredictable cases that are usually avoidable.

## Methods

The LACE index is an evidence-based tool used to identify patients with high probability for hospital readmission. The index is based on the assessment of four areas: length of stay, acuity of readmission, comorbidities, and emergency department visits in the 6 months prior to readmission. Each area is scored then all scores are collected to obtain the overall score, which ranges from 0 to 19. The higher the score, the higher the expectation of hospital readmission. Usually patients whose LACE index is less than 10 are considered at low risk of hospital readmission with less than 12% expected probability. All cases of hospital readmission were reviewed using the LACE index. Cases with a score of less than 10 are identified as low risk or unexpected and need detailed review and clear justifications from the care providers.

## Results

Implementing the LACE index for clinical review to identify unexpected or avoidable hospital readmission cases and communicating the results with the concerned caregivers was highly effective. Cases of avoidable hospital readmission and cases with a score of less than 10 decreased by 20% from 140 and 113 in 2017 to 105 and 82 in 2018, respectively.

## Conclusion

Implementing evidence-based tools to improve healthcare quality is always effective and highly valuable.



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# Vitalizing data analysis

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## Background

- Collecting key performance indicator (KPI) data manually.
- Wasting time in communicating with concerned departments.
- Errors with data entry and data reliability.
- Data retrieval was very difficult and time consuming.

Establishing a database that includes all the indicators of the Medical and Administrative Departments in the Royal Commission Health Services Program (RCHSP) is highly required to facilitate all the stages and processes of data management. It will enable the authorized staff and end users to enter the required information (KPIs) in an easy and convenient way, saving both time and effort. In addition, the new system will keep the top management informed at all times as they can access the system at any time and from any place. Moreover, all stakeholders at all levels can benefit from an easy, rapid, and accurate data retrieval process, allowing them to see the data analysis and print reports.

## Methods

Formation of a team from the Quality and IT departments has been done. The team had meetings with all the concerned departments to identify their KPIs and adjust their operational definitions and profiles. Afterwards, the team started to build up the new system with consideration of all the relevant regulations and standards related to data security and confidentiality. The built system has been tested before full implementation. Training was done for all users as well as orientation for the top management on how to access and benefit from the system.

## Results

- The new system facilitated the creation of any required report in no time.
- Data submission time increased from 40% to 95% in the new system.
- Top management can see real-time display on some indicators at any time.

## Conclusion

Vitalizing data is highly beneficial to healthcare organizations as they create a huge amount of data that are not fully utilized for improving quality and safety. In the future, RCHSP aims to upgrade the system to capture data directly from the Hospital Management Information System (HMIS) without any need for data entry.

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# Renal outcome in patients who underwent cardiac surgery using cardiopulmonary bypass

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## Background

Renal dysfunction is a significant variable in determining the outcome of the surgeries used to treat cardiovascular diseases - the most common being cardiopulmonary bypass graft (CABG) and valvular replacement (VR). In Saudi Arabia, the incidence of renal failure and diabetes is higher than that in most western populations. Our aim is to determine the renal outcome of patients who underwent cardiac surgery at King Faisal Cardiac Center (KFCC) over the past 3 years and explore the risk of preoperative renal function on the outcome.

## Methods

We conducted a retrospective cohort study of all patients older than 18 years who underwent cardiac surgery at KFCC from May 2014 to June 2017. Data were analyzed using the statistical package IBM SPSS 22.

## Results

The 244 patients who underwent cardiac surgery in this study period had a mean age of  $60.5 \pm 7.5$  years and mean body-mass index (BMI) of  $28.62 \pm 5.19$ . The patients in this sample had median postoperative creatinine of 77 (IQR 66-99.75) and median bypass time of 117 (IQR 84-143). There were five (2%) patients who died within 30 days, ten (4%) patients with temporary dialysis, 19 (7.8%) patients with postoperative renal dysfunction, and no patients with permanent dialysis. The data showed a significant relationship between levels of preoperative creatinine and postoperative renal dysfunction ( $p=0.0001$ , odds ratio 1.05, 95% CI 1.031-1.064). Time on bypass ( $p=0.998$ ), hypertension ( $p=1.969$ ), and diabetes ( $p=1.061$ ) were all not significant. CABG was done in 180 (72%) of the patients.

## Conclusion

The main predictor for poor renal outcomes for cardiac surgery is preoperative creatinine, while other variables such as age, sex, BMI, cardiopulmonary bypass time, diabetes, hypertension, and dyslipidemia did not show any risk to the renal outcome.

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# Reducing discharge delays in high dependency unit

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National Guard Health Affairs

## Background

Increased discharge time of an average 6.5 within the high dependency unit (HDU) results in increased costs and increased patient and staff dissatisfaction. Delays in discharging patients is one of the important indicators in our organization that has a direct link with patient access of care and quality of care. The KAMC-JD administration has set a gold standard for the discharge process duration of 4 hours after being deemed suitable for discharge by HDU unit medical staff. The 18-bed HDU is one of the busiest and highly demanded units within the hospital. Hence, reducing discharge delays, the occurrence of delayed discharges, and the reason for these delays is important because they impact on the efficiency and effectiveness of HDU services. Our aim is (1) optimal utilization of HDU beds by reducing waiting time of discharged patients by 50% in 12 months; and (2) improvement in multiple discharge processes in the HDU.

## Methods

This project was initiated by the multidisciplinary team in HDU KAMC-JD. The Lean Six Sigma methodology Define, Measure, Analysis, Improve, and Control (DMAIC) framework was used. The project started with the Define phase in February 2018. Baseline data were collected (October 2017 to January 2018). 3-month data pre-intervention and post-intervention were collected, including (1) discharge waiting time; (2) compliance to 4 hours discharge time; (3) discharge medication order time; (4) discharge order time; and (5) value stream mapping. Cause and affect analysis was also conducted. A run chart and departmental dashboard were used to track change. Minitab (v.17) was used for data analysis. Data were provided by the hospital information unit.

## Results

The baseline data in the pre-intervention period of February to April (285 patients) showed a mean waiting time of 8.28 hours with compliance of 55% discharge within 4 hours. A multidisciplinary team worked towards the quality improvement aim of reducing the discharge delays. Post-intervention data showed compliance to the 4-hour discharge time to be 70%. With 302 patients audited, average mean waiting time was reduced to 5.5 hours with a significant p value ( $p=0.04$ ).

## Conclusion

The process of discharging patients is complex requiring the coordination of the multi-disciplinary team, including physicians, nurses, admin support, patients, and their families. The HDU Ward C26 unit commenced initiatives to reduce the discharge delays for patients by using the Lean Six Sigma methodology. The project streamlined the discharge flow and processes by identifying root causes and eliminating the waste, this has shown improvement in maximizing HDU unit resulting in improved patient care, increased overall patient satisfaction and effective bed management for the hospital.

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# Assessment of the knowledge of inserting and maintaining central lines in the adult intensive care units at King Abdulaziz Medical City - Riyadh

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## Background

Central line-associated bloodstream infections (CLABSIs) create a huge burden of cost on healthcare organizations. Reducing the incidence of CLABSI will not only provide better healthcare and safety to patients but will also reduce the costs associated with additional days of stay. Central venous catheters are used in the healthcare system for a variety of indications, and bloodstream infections are one of the major complications. Central line bundles are a group of guidelines created to minimize and prevent infections acquired during administration. The purpose of our research was to assess the knowledge of central line bundles among healthcare workers in intensive care units.

## Methods

This cross-sectional study was done in King Abdulaziz Medical City in Riyadh and included 171 nurses and 41 physicians working in the three intensive care units (surgical, medical, cardiac). Participants' awareness of central line bundles was assessed using a questionnaire that included three sections: demographics, knowledge, and practice.

## Results

The vast majority of the healthcare workers answered questions correctly regarding knowledge of CLABSI prevention (wearing maximal barrier precautions, washing hands, using chlorhexidine at insertion site, documenting the procedures, etc). The average knowledge score among participants was 82%. A major factor determining knowledge of central line bundles is training. 60% of the participants had received central line training. Participants who received CLABSI bundle achieved a high mean score of 84%, whereas this score was lower in those who had not received training (78%).

## Conclusion

Our results suggest that receiving CLABSI training is associated with better knowledge and lower complications rate. Educational interventions should be used to address the gaps regarding knowledge and practice regarding the prevention of CLABSI and to ensure that healthcare workers use evidence-based prevention interventions.

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# Evaluating the effectiveness of a simulation-based peripherally inserted central catheter (PICC) skills training program in the outpatient department

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Nursing Education

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## Background

Following implementation of the Outpatient Intravenous Antibiotic Program (OIVAP) clinic in the outpatient department (OPD), nurses were dealing with more patients receiving long-term intravenous antibiotic therapy via a peripherally inserted central catheter (PICC) line. Only 20% of 150 OPD nurses were competently managing these patients. However, because of staffing issues and increased demand, more nurses were required to cover this clinic. This presented a challenge because most nurses had not performed this skill before. A simulation-based educational workshop was conducted by the Nursing Education Department to fill this gap. Simulation training has a well-known history in military and aviation industries, but is relatively new to nursing practice. The hospitals' Nursing Departmental policy on educational requirements requires nurses to perform annual competencies for skills that are likely to cause significant patient harm if done incorrectly, calling for nurses to keep their knowledge and skills valid. This study aims to evaluate the effectiveness of the simulation-based training program on the knowledge and skills of OPD nurses.

## Methods

13 workshops were conducted for 109 participants over a period of 3 weeks. A pre-assessment knowledge questionnaire was distributed. The workshop covered theory and practical demonstrations using a central line simulator model, in a simulated clinical environment. A post-assessment knowledge questionnaire was then distributed for comparison.

## Results

Out of those sampled, the pre-assessment results showed that 78% had not performed the procedure of administering intravenous drug therapy via a PICC line at all. The mean knowledge scale was 0 out of 7, which indicated that their knowledge about the procedure was better than their practical experience. Post-assessment results indicated that 67.8% felt confident to perform the procedure in an actual clinical environment.

## Conclusion

Simulation-based educational interventions are an effective way to address skills gaps where large numbers of nurses need to be trained while minimizing the chances of patient harm. More confident nurses ease the burden on staffing levels ensuring more referrals. This gives an opportunity for fewer hospital admissions for procedures that can be safely done in an outpatient environment. Above all, patients are safe when nurses are confident in their care.

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# Perception of the Saudi community towards human papillomavirus vaccination in Jeddah, Saudi Arabia

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## Background

The prevalence of cervical cancer is increasing at an alarming rate in women in Saudi Arabia. However, human papillomavirus (HPV) vaccination may prevent this type of cancer. HPV is transmitted through sexual contact to married females. Many females are infected with HPV shortly after the onset of sexual activity. HPV infections can lead to cervical cancer in women. The aim of this study is to examine the awareness and perception of the Saudi community towards HPV vaccination.

## Methods

A cross-sectional study has examined the perception and awareness of Saudi individuals towards HPV vaccination. A sample of 278 randomly selected Saudi individuals were included. A close-ended survey questionnaire was employed to collect the data on HPV vaccination.

## Results

Around 78.30% of female and male participants were unaware of the availability of HPV vaccination against cervical cancer. 90.06% of females supported cervical cancer screening (Pap smear) by gynecologist after vaccination. Only 40.66% visited the gynecologist for screening. Results demonstrated that 85.77% of females agreed on receiving expensive vaccination. Conversely, 97.48% supported HPV vaccination free of charge.

## Conclusion

There is a lack of awareness about the vaccination and its availability and a lack of knowledge about Pap smear and cervical cancer. The data obtained can be used as a standard to devise effective awareness programs. Data were collected particularly from Saudi Arabia for evaluating the perceptions of the Saudi community. Both males and females were observed to be interested in taking vaccination and prevention initiatives against cervical cancer, whereas there is a lack of awareness observed among the males and females included in the study. Based on the above, make the HPV vaccination available all over Saudi Arabia and request the Ministry of Health to give this vaccination free of charge as part of the pre-marriage national examination program.

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# Patient satisfaction with the care provided in the emergency department at a care center in Saudi Arabia

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## Background

Patient satisfaction is an important issue in the healthcare process and plays a crucial role in measuring the effectiveness of healthcare delivery. It is of absolute importance in quality assessment activities as its comprehensive analysis can highlight noble and problematic aspects of each hospital. This study aimed to assess the emergency department (ED) patient satisfaction in a care center in Saudi Arabia and to determine the factors affecting satisfaction.

## Methods

In this descriptive cross-sectional study, the sample was selected from 375 patients admitted to the ED of KAMC between December 2016 to September 2017. For each patient, a validated questionnaire was filled and collected by non-random convenient sampling in two phases: August/September and December/January.

## Results

In total, 375 patients were entered into the study. The mean score of overall satisfaction was 57.59 (8.69) (range 19-70). The domain that had the highest excellent score was admission (171, 45.8%), while the domain that scored highest in poor satisfaction was nurses' care (141, 37.6%). Overall satisfaction was mostly good (96, 50.8%). Those who had been hospitalized in the last 3 days prior to filling the questionnaire, and those who waited a longer time to see the doctor had significantly lower satisfaction ( $p=0.007$  and  $p<0.001$ , respectively).

## Conclusion

Higher satisfaction levels were seen among patients who were treated in the main ED, admitted during morning shifts, who visited the ED during slow season (August/September), and were seen by the doctor with shorter waiting time. Patients were most satisfied with admission and least satisfied with nurses' care. Patient satisfaction reports can complement other sources of information about quality. Further research is recommended in order to measure specific aspects of medical care and how it has been provided.

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# Anticoagulation variability as a predictor of bleeding in patients with mechanical heart valves

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## Background

Patients with mechanical heart valves require life-long anticoagulation with warfarin. Variability of anticoagulation is a major concern in such patients. Previously, we found that mechanical heart valve patients spent only 66% of their time within the therapeutic range (TTR). However, there is currently little data relating quality of anticoagulation to bleeding risk in patients with mechanical heart valve prostheses.

## Methods

This was a cross-sectional study of patients attending a Nurse-Led Heart Valve Anticoagulation Clinic. Data analyzed included patient demographics, comorbidities, and concurrent drug therapy to calculate HAS-BLED and ATRIA scores. International normalized ratio (INR) values were used to calculate time spent in the therapeutic range (TTR) by the Rosendaal Method. The relationship between variables was analyzed using linear correlation (Spearman Rho) and logistic regression as deemed appropriate. Data were analyzed using SPSS (SPSS for Windows), with  $p < 0.05$  considered significant.

## Results

The study cohort consisted of 260 patients with a mean age of  $54 \pm 15$  years. The mean TTR was  $66 \pm 16\%$ . 27 (10%) patients had HAS-BLED scores of more than 3 (high risk). Bleeding (cerebral, gastrointestinal, or hemoglobin  $< 100$  g/L) occurred in 32 (12.3%) patients; 12 (37.5%) of these patients had a HAS-BLED score of more than 3 ( $p = 0.0001$ ). TTR was not different between patients with or without bleeding ( $64.1 \pm 19.4\%$  versus  $66.3 \pm 16.1\%$ ). On the other hand, mean HAS-BLED and ATRIA scores were significantly higher in patients who had bleeding. Using multivariate analysis, ATRIA score followed by HAS-BLED score was the best predictor of bleeding. Age, sex, and TTR as a measure of INR variability did not show a significant difference between the two groups.

## Conclusion

Similar to previous reports of patients with atrial fibrillation, ATRIA and HAS-BLED scores were the best predictors of bleeding in our cohort of patients with mechanical heart valves, with no independent contribution of TTR to estimation of bleeding risk.



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# Using simulation to assess competency in new nurses

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## Background

Measuring competencies in nursing is critical to ensure safe and effective care of patients. Usually, new nurses struggle to cope with the demands of new roles and face difficulties in completing the required competencies on time. Being a clinical resource nurse based in the clinical areas and responsible for new nurses, I have observed that there is a gap in this area which may impact on patient safety. I work as a clinical resource nurse in Prince Mohammed Bin Abdulaziz Hospital in Madinah (PMBAH), Kingdom of Saudi Arabia. The focus of this paper is to assess the knowledge and confidence of newly hired nurses in PMBAH. Currently, new nurses are given 5 days of orientation in class and are then sent to clinical areas to start working under a senior nurse. The aim of this study was to assess the confidence and knowledge of new nurses hired by PMBAH.

## Methods

Simulation methodology was used to train new nurses in PMBAH. A 2-day training schedule was arranged with 2 hours for each competency session, with eight sessions in total. Each session included a short briefing about the scenario and introductory video followed by a demonstration by the simulation facilitator. The new nurse was then allowed to run the scenario with no interruption, followed by individual briefing directly to consolidate and transform the nurse's experience. Nurses were allowed to express their feelings in their own words. Pre and post self-assessment of participants' knowledge and confidence were later assessed.

## Results

There was a big difference in the pre- and post-assessment results; the majority of the nurses have shown increased knowledge and confidence after going through simulation sessions.

## Conclusion

We have identified that simulation positively impacts nurses' learning experiences by replicating the bedside setting in a mistake-free environment. Therefore, simulation sessions for new nurses are very helpful to raise knowledge, confidence, and the ultimate safe delivery of patient care. We can claim that simulation is an up-to-date and innovative learning strategy, especially when addressing direct patient care aspects including nursing skills and procedures. With the current increase in medicolegal cases, we can conclude that simulation is both a safer and economically viable way of training nurses. Increased confidence and knowledge using simulation during orientation has been shown to reduce stress levels in clinical areas.

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# Prescriber behaviors that could be targeted for change: an analysis of behaviors demonstrated during the prescribing process

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## Background

The prescribing process for children with cancer is complex, and errors can occur at any step. As a result, many interventions have been used to reduce errors. However, few of them have been designed based on an understanding of the prescriber behavior that can lead to errors. In order to design effective behavior change interventions, it is first important to understand the prescribing process and identify prescriber behaviors that could be targeted for change.

## Methods

This study used two sequential phases. First, the prescribing process was observed and then described using the hierarchical task analysis (HTA) method. Second, prescriber tasks were analyzed using the behavior change wheel (BCW) approach to identify promising behaviors for change. These identified behaviors were prioritized based on information collected from focus groups with prescribers and chart review of errors made in the ward. The hospital's Institutional Review Board approval has been granted.

## Results

The HTA results showed that the prescribing process was complex and involved multiple tasks performed in varying orders. Applying the BCW identified 32 candidate behaviors for potentially reducing prescribing errors. However, after prioritizing these behaviors, only two emerged as promising candidate behaviors for intervention: writing drug indications at the time of prescription and using a predefined order sentence when ordering medications.

## Conclusion

Applying the HTA and BCW methods was helpful in identifying potential behaviors for change. Having identified promising behaviors, future work could explore what needs to change with respect to individuals and their work environments to achieve the desired change in these identified behaviors.

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# Successful improvement in the quality of cleaning and disinfection at a specialized tertiary care hospital in Riyadh, Saudi Arabia

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## Background

Environmental cleaning is critical for reducing the burden of healthcare-associated infections and multidrug-resistant organisms. The objective of the current study was to improve the quality of cleaning and disinfection done by housekeepers.

## Methods

An interventional study was done between October 2018 and February 2019. The intervention included training of 130 housekeeping staff; redefining cleaning and disinfection responsibilities between housekeeping and nursing; adding a checklist for surfaces to be cleaned or disinfected; and emphasizing the inspector's auditing role. The intervention engaged relevant staff partners from infection control, housekeeping, nursing, and environmental services. The study outcome was the frequency of effective cleaning done by housekeepers. It was assessed by comparing the photos taken from specified room sites (pre-prepared by fluorescent gel) using black light before and after cleaning. Six highly touched areas in patient rooms were chosen. The study was divided into three phases: pre-intervention assessment (October 2018), intervention (November 2018 through January 2019), and post-intervention reassessment (February 2019).

## Results

A total of 27 rooms with 162 opportunities were assessed during the pre-intervention phase. The findings showed that only 39 (24.1%) of the 162 opportunities were effectively cleaned. The frequencies of effective cleaning in different sites were: light switches 11.1%, door knobs 25.9%, water faucets 37%, telephones 25.9%, bed rails 14.8%, and patient tables 29.6%. A total of 33 rooms with 198 opportunities were assessed during the post-intervention phase. The findings showed that 116 (58.6%) of the 198 opportunities were effectively cleaned. The frequencies of effective cleaning in different areas were: light switches 42.4%, door knobs 84.8%, water faucets 75.7%, telephones 60.6%, bed rails 54.5%, and patient tables 63.6%. The overall improvement in effective cleaning in different sites was 34.5% ( $p < 0.001$ ), being highest for door knobs (58.9%,  $p < 0.001$ ) and lowest for light switches (31.3%,  $p = 0.014$ ).

## Conclusion

A multidisciplinary intervention including training and auditing of housekeepers was successful in significantly improving cleaning and disinfection at different sites in the patients' rooms. Frequent assessment and feedback may need to be continued until reaching an optimal level. Further studies are needed to evaluate the impact of improved cleaning on infection rates.

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# Monitoring the quality indicators of blood transfusion services as a method to improve patient safety at King Abdulaziz University Hospital

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## Background

A quality indicator is measurable information gathered at the critical control points in a process or procedure for monitoring, assessment, and improvement. Quality monitoring is an important tool used to review blood transfusion practice and provide feedback on transfusion trends in blood transfusion services. Quality indicators can improve quality standards and support patient safety through setting priorities and process improvement. The aim of this study was to report 5 years' experience of monitoring the quality indicators at KAUH and to measure its impact on the blood transfusion practice as a tool in hemovigilance system implementation for patient safety.

## Methods

This was a retrospective study of data collected over the past 5 years (2013-2017) at KAUH, Jeddah, in which the quality indicators for certain parameters were analyzed and benchmarks were set for blood donor adverse reactions, transfusion reactions, fresh frozen plasma (FFP) in-date wastage, and cross match to transfusion (CT) ratio. Data were forwarded to the Hospital Transfusion Committee (HTC) for review. Deviations were identified and corrective actions were taken. The outcomes were used to plan for improvement.

## Results

Among a total of 60,631 blood donors, 282 donor reactions were reported, resulting in a rate of 0.46%, mostly in the form of mild dizziness. 285 adverse transfusion reactions were reported among 99,564 total blood transfusions, resulting in a rate of 0.28%; most were allergic and febrile reactions. Monitoring of the adverse donor reactions showed a decreased incidence; however, the adverse transfusion reactions were under-reported. The FFP in-date wastage was 2205 among 22,590 requested FFP units, resulting in a high rate of 9.76%. The CT ratio was 1.24. Safety improvements were implemented by a multidisciplinary quality improvement team to determine the critical control points and to address the factors contributing to high FFP wastage.

## Conclusion

The use of quality indicators as a tool for implementing a hemovigilance system can provide a better understanding of areas for improvement in the quality of the work and safety of patients. Establishing guidelines for appropriate clinical use of blood and proper communication between clinical transfusion staff and practitioners is expected to enhance these features along the blood transfusion chain. The use of a similar model in other institutions will facilitate the local benchmarking between hospitals, which is a feasible method to lower transfusion risk and cost and to improve quality outcomes.

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# Lab quality improvement project (monitoring serology rejection)

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Prince Mohammed Bin Abdul Aziz Hospital - Al Madinah

## Background

This project was initiated because of the observation that serology rejection rates were increasing incrementally. The quality indicator displayed this; therefore, an intervention was necessary to reduce the amount of wastage of samples, patient recalls, supplies, and manpower. The aim of this project was to reduce the number of rejected samples, reduce recalls of patients and redraw of the samples, and to provide the best service to our customers.

## Methods

- Using the quality indicators for the statistical measuring of the amount of serology samples rejected.
- PDCA (plan-do-check-act) cycle.
- Quality indicator:
  - Numerator is serology rejected tests (lithium heparin and SST)
  - Denominator is serology total tests done (lithium heparin and SST)
  - International benchmark value 0.56%
  - Baseline quality indicator was measured and then monitoring was done after implementation of interventions.
- Interventions:
  - Contact nursing education about the training of collection procedures, especially with the wards that have high rejection specimen rates
  - The educational session conducted in receiving and outpatient department staff expanded to all other hospital departments
  - Collection procedure changed from four tubes to one lithium heparin tube according to insert sheet, which was a simplified procedure.

## Results

The quality indicator in the first 6 months showed that 0.8% of the serology samples were rejected. After the intervention using the various strategies, nurse education sessions, change of procedure, and specimen test menu information, 0.36% of the total samples were rejected, therefore showing a significant improvement in the rejection rates in serology. The continual improvement was recommended to be sustained by implementing the long-term use of the strategies used in the study.

## Conclusion

The project was done to improve workflow and minimize wastage in terms of time and cost, and to improve patient outcomes. This intervention was successful in the overall aims and objective of the project. The lesson learnt was that the educational session conducted as part of the intervention plan improved the skills and techniques used by nurses when performing the procedures. The altered procedure helped to significantly reduce the number of rejected specimens. The overall aim of the project was to implement a process that could be applied across all sections in the Department of Pathology and Laboratory Medicine. This was to improve patient safety, care, and outcomes.

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# The impact of a computerized physician order entry (CPOE) system on the incidence and nature of drug-related problems (DRP) in pediatric wards in King Abdulaziz Medical City - Jeddah

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## Background

Prescribing a drug for a child is not a simple task because children pose distinct challenges for healthcare professionals in prescribing, dispensing, and administering any drug. Published studies investigating pediatric adverse drug events (ADEs) showed that drug ordering is the main stage of the medication process where ADEs originate and accounts for 79% of ADEs, of which 34% are related to incorrect dosing. It has been recognized that computerized physician order entry (CPOE) can reduce medication errors in adult and pediatric populations.

## Methods

An observational prospective cohort study was conducted on all pediatric patients aged 0-14 years admitted during the study periods to pediatric wards over a 3-month period. All reported drug-related problems (DRPs) were validated using the same method used in our previous published studies. DRPs were peer-reviewed by an expert panel consisting of a pediatrician, clinical pharmacist, and researcher. A final decision regarding validation of a DRP case was made by consensus after discussion within the group. Once a DRP was validated, the panel also assessed it for severity and preventability.

## Results

657 pediatric patients were included. Of these, 235 patients suffered from 328 DRPs. Overall DRP incidence was 35.8% (95% CI 32.1-39.6). Almost all identified DRPs were deemed preventable (99.7%) and 95.1% (n=312) were moderate in severity. The most frequently reported diagnoses were bronchiolitis/pneumonia (n=32). Nearly half (328 [49.9%] of 657) of patients experienced at least one DRP. The percentage of male patients with DRPs (190 [58%] of 328) was higher than the percentage of female patients with DRPs (138 [42%] of 328). However, there was no significant difference in DRP incidence between male and female patients ( $p=0.239$ ). The highest DRP incidence reported on the medical ward was 32.3% (95% CI 27.3-37.3). The most frequently involved drug classes in DRPs were antimicrobial medications (n=62), followed by respiratory medications (n=41), gastrointestinal drugs (n=21), vitamins (n=14), steroids (n=9), and nonsteroidal anti-inflammatory drugs (NSAIDs; n=8). Using the significance level of 0.05, no significant difference was found in DRP percentages before and after CPOE use ( $p=0.472$ ).

## Conclusion

DRPs in hospitalized pediatric patients are common. The vast majority were assessed as moderate in severity and deemed preventable. In this study, the majority of DRPs reported were related to dosing and drug choice problems. Further study is needed to investigate the DRPs associated with off-label use of medication in children.

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# Epidemiology of preventable drug-related problems (DRPs) in hospitalized children: single institution observational study

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## Background

Drug-related problems (DRPs) “are the unwanted effects of a drug that potentially lead to harmful outcome”, which receive substantial attention. Prescribing a drug for children is considered a challenging process for all healthcare providers and possesses an economic burden to the healthcare system. Hospitalized pediatric patients, in particular, represent a population at risk for DRPs. The epidemiology of preventable DRPs in children in Saudi Arabia remains scarce, which poses distinct challenges to all healthcare professionals. We aimed to characterize preventable DRPs in hospitalized children at KAMC-Jeddah.

## Methods

This prospective observational study included children (aged 15 years or younger) admitted to pediatric units (excluding cancer units) at King Abdulaziz Medical City (KAMC)-Jeddah, which is located in Jeddah, the largest city in Makkah Province in the Kingdom of Saudi Arabia. The hospital is a 751-bed referral center. Five diverse pediatric wards were included (general, surgical, emergency department [ED], neonatal intensive care unit [NICU], and pediatric intensive care unit [PICU]). We excluded patients admitted to pediatric cancer units, patients with no medications, if admission was less than 24 hours, and patients aged more than 15 years. The study was done over a 3-month period to determine the incidence of preventable DRPs and investigate the possible associated factors (sex, age, admission location, type of admission, and number of medications).

## Results

A total of 319 DRPs were identified in 235 patients, in which 280 (87.8%) of 319 DRPs were deemed to be preventable. The majority of preventable DRPs were related to dose selection (219 [78%] of 280). None of the preventable DRPs were life-threatening or fatal. The majority were assessed as moderate in severity (264 [94.3%] of 280). There was no significant difference between DRP incidence with age (mean 3.5,  $p=0.389$ ), sex ( $p=0.436$ ), and weight (mean 13.47,  $p=0.323$ ). Younger children (aged 2 years or younger) admitted to the PICU were more likely to have a DRP (odds ratio 4.44,  $p=0.000$ ). Scheduled admissions were 2.89 times more likely to be exposed to DRP compared with transferred admissions ( $p=0.005$ ). Additionally, DRP incidence increased proportionally to the number of medications.

## Conclusion

Our results show a high incidence of preventable DRPs, which were found to be related to dosing and drug choice problems. These results may be used for designing the epidemiology study in the pediatric population aiming to establish appropriate prevention strategies towards improvement and safe medicine use in this vulnerable patient population.

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# Comparison of the linked cancer registry and cancer patient experience survey datasets in England and the United States

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## Background

Patient care experience surveys are now used internationally to assess, monitor, and improve healthcare quality. The National Cancer Patient Experience Survey (CPES) is an annual English survey that invites patients to report their experiences of National Health Service (NHS) cancer care. The Consumer Assessment of Healthcare Providers and Systems (CAHPS) survey is widely used in the USA to assess patients' experiences of healthcare plans. Several years of collated data for each survey have recently been linked to population-based cancer registry data. We aimed to compare strengths and weaknesses of the datasets in order to consider the questions they may best answer.

## Methods

We obtained published information about both datasets, and compared data sources, time period, patient age, cancer types, survey method and response rate, linkage method, and question themes.

## Results

The English dataset of 233,445 patients was created by linking 2010-2014 national CPES with cancer registry data by matching individual identifiers, whereas the US dataset of 150,750 was created by first merging national Medicare data with regional Surveillance Epidemiology with End Results (SEER) data and then with all 1998-2010 CAHPS survey data. The major differences were that the US dataset was largely limited to patients over the age of 65 years and included a large non-cancer comparison group of 571,318 patients as well as data on health costs. Both linkages included all cancer types, with breast, prostate, colorectal, and lung cancer representing 50% of English and 61% of US patients. Both were postal surveys, with non-respondents being followed up by mail in England and by telephone in the USA. Response rates were similar in England (67%) and the USA (71%). The questions themes were similar, with CPES focussing on more cancer-specific experiences.

## Conclusion

The English dataset is likely to provide more detailed and representative data answering questions about cancer experiences in the English population. However, it may be possible to use both datasets to compare the experiences of older patients receiving government-funded cancer care in each country. The addition of economic data to English survey data as in the US data is an intriguing avenue for future research. A translated version of CAPHS is being used in Saudi Arabia, meaning that further data linkage and international comparisons may be possible in due course.



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# Electronic occurrence variance reports (eOVR) management system

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## Background

The Royal Commission Health Services Program (RCHSP) has been consuming thousands of occurrence variance report (OVR) forms (paper-based) to report all hospital incidents, with 200-300 OVRs per month. This has resulted in substantial challenges for the risk management unit regarding regular tracking, trending, and analysis of all OVRs while complying to the determined timeframes. The Quality Management and Planning Department (QMPD) and information Technology (IT) Department have started collaboration on an initiative to make the incident reporting system electronic to capture incident data, do incident follow-up, and communicate incident learning across all departments through an efficient, effective, and user-friendly system with good follow-up capability. The aim of this study was to improve the timeliness, efficiency, easy accessibility, and effectiveness of the OVR system.

## Methods

The new system is web-based and staff can access it using their usernames and passwords. Filling an OVR is easier as data entry occurs by ticking from displayed options with the availability of entering free text for more details if needed. Automatic notifications will be sent to the relevant staff throughout the organization. A comprehensive action assignment and follow-up system has been developed. Easy access to data across the organization and updated real-time view of the OVR dashboard are also available any time. Forwarding submitted OVR(s) to appropriate entities and tracking them has become more accurate and efficient. Pilot testing has been conducted for 2 months before full implementation.

## Results

The electronic system has significant benefits making it more convenient to all stakeholders. The number of reported adverse events, near misses, and sentinel events further increased. The ease of access to the web-based module to fill OVRs, the real-time incident log, the ability to attach any type of files to log entries, and the automatic time-stamped audit log/referencing are all features that make the new system more convenient. The action assignment and easy tracking system, the integrated emergency notification, and the electronic forms management enabled the risk management unit to manage the system more effectively and efficiently. Processing an OVR by quality staff decreased markedly from more than 120 minutes in the old system to 20 minutes in the new electronic system. The new system secured access and ability to create graphical representation of key performance indicator (KPI) trends, and the dashboard with color-coded visual indicators are also important features.

## Conclusion

A well designed e-OVR system has a significant positive impact on the effectiveness and efficiency of any healthcare risk management system.

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# Quality and patient safety training for residency programs: RCMC experience

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## Background

Maintaining the quality of care and patient safety remains a top priority for the RCHSP, which requires all staff including medical and nursing trainees to be quality and patient safety oriented. Several medical and nursing residency programs have started in the RCHSP during the past 3 years. The number of medical and nursing trainees in residency programs has increased, exceeding 50 trainees. These trainees currently represent almost 25% of the medical staff in the RCHSP, distributed in several departments. They are involved in care provision and their commitment to quality and patient safety is essential to ensure that the levels of care are maintained. Currently, quality and patient safety are not included in their structured training program. There was a need to establish a training program in quality and patient safety for trainees in residency programs.

## Methods

Quality and training departments in RCHSP started an initiative to conduct a training program for trainees in residency programs to cover the basics of quality improvement and patient safety. The training has been organized as a full-day workshop including several lectures, interactive sessions, and hands-on training, covering important topics such as basic quality and patient safety concepts, international patient safety goals, quality tools and improvement methodologies, accreditation in healthcare, and standards for documentation in medical records. A pre-test was conducted to assess the basic knowledge of attendees and a post-test was done to assess the impact of the training on their knowledge. The trainees were divided into three groups and the workshop was conducted three times to make the training more interactive and effective.

## Results

Although attendance was encouraged but not compulsory, the attendance rate exceeded 95% of the target population. The average score in the pre-test was 4.5 out of 10. Only 30% of the trainees exceeded the pass score of 6 out of 10, and 25% had very low scores of less than 3 out of 10. The post-test results showed marked improvement, with the average score exceeding 6.5 out of 10. 60% of the trainees exceeded 6 out of 10 and only 5% got low scores of less than 3 out of 10.

## Conclusion

Integrating quality and patient safety training in residency programs is essential. The results are highly promising. This area represents a big opportunity for improvement.

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# Assessment of the effectiveness of pain management among trauma patients in the emergency department

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## Background

In every emergency department (ED), pain is the most common chief complaint, especially among trauma patients. However, two-thirds of trauma patients are discharged from EDs with moderate to severe pain. Therefore, pain management is an important part of care in trauma patients in the ED. According to a study, 27% of trauma patients were discharged although they still felt pain, and 48% of patients were not reassessed. Previous studies have reported inadequate pain control in the ED, and pain is frequently requested to be eliminated by patients despite their conditions. To our knowledge, our study is the first of a kind that addresses pain management among trauma patients in the ED in the Kingdom of Saudi Arabia. The objectives of the study were to:

- Determine whether trauma patients receive pain assessment and/or reassessment.
- Determine whether trauma patients receive the proper pharmacological and/or non-pharmacological intervention to relieve their pain (according to clinical practice guidelines of King Abdulaziz Medical City [KAMC]).
- Relate triage score to appropriate pain management.
- Measure the differences between male and female responses towards pain management.

## Methods

This retrospective cohort study included all adult trauma patients who attended the ED at King Abdulaziz Medical City in Jeddah from the period June 2016 to July 2018. Sample size was calculated based on the number of trauma patients presenting to the ED and 403 files were reviewed. After excluding any patients younger than 18 years old, intubated patients, and patients with GCS level below 13, the number of remaining patients was 332. Data were collected from the health information system (BestCare). Data were analyzed using SPSS version 24.

## Results

Our results showed that the mean difference between pain scores before and after pain management is 1, which is not clinically significant. The percentages of patients that were not assessed or reassessed were 31% and 29%, respectively. The median time between arrival and initial assessment was approximately 19 minutes. The percentage of patients who were administered the right drug was 36.7%. The triage scores were not aligned with their conditions. There was no statistical difference between males' and females' change in pain score.

## Conclusion

Compliance to pain assessment and reassessment in trauma patients is suboptimal. This reflects on the management of pain in trauma patients. Furthermore, appropriate pain management in relation to pain scores was also suboptimal. Knowing the negative short-term and long-term effects of poor pain management in this subset of patients raises the need for improvement using pain assessment and management tools. We recommend staff education of the importance of pain management. Additionally, a quality improvement project is recommended to enhance pain management in trauma patients. Further studies should be carried out in the Kingdom in different centers for trauma and non-trauma patients to assess and improve the performance in this important aspect. Relating this to patient satisfaction and long-term consequences is also recommended.

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# Aiming for zero incidence of invasive fungal infection (IFI) in very low birthweight infants: is it achievable?

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## Background

Invasive fungal infection (IFI) in neonates is a common cause of late-onset sepsis and mortality, with poor neurodevelopmental outcome among survivors. In very low birthweight (VLBW) infants (birthweight <1500 g), incidences of IFI varied from 2% to 25%, while in extremely low birthweight (ELBW) infants (birthweight <1000 g), incidences were up to 74%. Many studies of fluconazole prophylaxis (FP) in more than 5000 neonates have demonstrated efficacy, reducing IFI by 80% and mortality by more than 90%. Several studies reported zero incidences of IFI achieved by strict protocols of FP. To our knowledge, no local published data have reported zero or rates of IFI in VLBW infants. The objectives of the study were to estimate the incidence of IFI in VLBW infants receiving FP during the study period 2011-2015 at King Abdulaziz Medical City, Jeddah, and to compare the incidence and risk factors of IFI with two historical periods.

## Methods

This was a retrospective cohort study between January 2011 to December 2015 (period III), with comparative historical control. All VLBW infants who received FP were included. Infants who were out-born, with congenital anomalies, or who died within 72 hours were excluded. Fluconazole prophylaxis 3 mg/kg, twice weekly, was started within 48 hours and continued for 4-6 weeks. In 2005, FP was given to VLBW infants then restricted to ELBW infants in 2012 based on a unit audit. As per discretion of the neonatologist, some infants weighing more than 1000 g were given FP. Patients' primary outcomes and risk factors were compared with two previous periods. Period I (2003-2004) was defined as the pre-prophylaxis epoch, when there were no FP policies. In period II (2005-2006) FP was started in all VLBW infants. Data were entered and analyzed in SPSS version 23.

## Results

Out of a total of 15,827 livebirths, 106 infants were analyzed from period III. Patients' demographics and risk factors were compared with period I (n=94) and period II (n=102). Patients in period III had shorter gestation and significantly less use of broad-spectrum antibiotics for more than 7 days, H2 blockers, mechanical ventilation for more than 24 hours, postnatal steroids, and parenteral nutrition for more than 7 days. There was a significant reduction in IFI from period I (14%) to period II (2%). In period III this reduction continued to almost zero (0.4%), with only one case of IFI. There were no reported cases of resistance to fluconazole.

## Conclusion

The rate of IFI in VLBW infants continued to decrease over the past decade mainly due to the use of FP. Further reduction could be attributed to applying good clinical practice measures.

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# Effect of implementing an early warning scoring system on patient outcomes

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## Background

Patient safety is a key priority for hospitals, a public health problem, and a human rights issue. Acute patients usually exhibit warning signs before experiencing critical health problems. These signs are often not recognized, which increases patient risk. Early recognition of deteriorating patients may improve the quality of healthcare and prevent severe complications. This study aimed to implement an early warning scoring system (EWSS) in an acute medical ward at King Abdulaziz Medical City (KAMC), and assess the effects of EWSS on patient outcomes.

## Methods

The improvement project applied a FOCUS-PDSA model, by first identifying the problem and then implementing EWSS as an intervention. Physicians and nurses were educated about the EWSS application. Nurses were trained on how to measure, calculate, and take actions upon scores, and when to call physicians for emergency assistance when a patient score reached an abnormal value based on the EWSS actions. A pocket-sized version of the EWSS tool was distributed to staff as an announcement and motivation. The intervention was carried out in small PDSA cycles and repeated, which enabled potential errors to be tackled, ensured accuracy of nursing documentation, validated the EWSS tool, and refined the implementation process. To assess the intervention, a total of 296 patients were observed for 6 months (November to April) before and after implementing EWSS for changes in three main indicators: mortality rate, intensive care unit (ICU) transfers, and CCRT reviews. To assess perception and satisfaction, a cross-sectional survey was administered to a convenient sample of staff in day and night ward shifts. Data were collected daily during the study period, entered into an Excel file, then imported to SPSS for analysis.

## Results

After implementing EWSS, mortality rate ( $p>0.05$ ), ICU transfers ( $p<0.05$ ), and CCRT reviews ( $p>0.05$ ) were reduced. Staff perception towards EWSS implementation was high; 86% indicated a good understanding of the purpose of the intervention, 71% stated that EWSS helped in recognition of patients before deterioration, and 50% perceived the intervention as successful and recommended its implementation in other areas of the hospital.

## Conclusion

The findings showed that EWSS implementation was promising and well-perceived by staff as an efficient management tool towards patient safety. Yet, there is an urgent need to automate EWSS before implementing it at a large scale to decrease workload, record duplication, and score calculation errors. More efforts need to be carried out in staff training, motivation, and support as they are key aspects towards success.

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# Formulating an electronic trauma registry in the pediatric emergency trauma center

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## Background

Trauma registry is a fundamental part of a comprehensive trauma care system. Improving trauma care and preparing for resource utilization and disaster preparation require data collection and analysis. Trauma registry captures data for research, measures trauma systems outcomes, and supports quality improvement through assessment of the appropriateness and effectiveness of the trauma system. Trauma registry sets trends in the identification of injury by age, and its modality. It also generates data for the evaluation of effectiveness and timeliness of trauma care service provided by an institution. As the first pediatric trauma care center in Saudi Arabia, King Abdullah Specialized Children's Hospital Emergency Department (KASCH ED) piloted the development of trauma registry with the cooperation of the Data Business Intelligence Management (DBMI). An initial design of the trauma database was established through efforts of the KASCH ED staff, trauma registry committee members, facilitators, and expert advice from health information technologists. Moreover, a dataset was designed to incorporate inclusion and exclusion criteria suitable for the International Classification of Disease (ICD 10) used in the BestCare system.

## Methods

The QI Team initiated a retrospective study of 668 trauma patients who presented to the KASCH ED in August 2018. The following data were extracted: demographics, mechanism of injury, trauma diagnosis, severity of injury, and disposition of patients. All data were extracted from BestCare, which is the hospital information system, by DBMI, using the complaint initial assessment by ED staff.

## Results

Of 7479 ED visits in August 2018, 668 were trauma cases, of which the majority were in the age group 1-4 years (45.2%) followed by 5-8 years (25.6%). Males were more commonly affected than females. Among these trauma cases, the most common mechanism of injury was fall (59.7%), followed by injury (33%, i.e., injury caused by door trauma, object fell on patient, kitchen injury, or bicycle/motorcycle injury), burns (4.3%), traffic accidents (2.40%), and near-drowning (0.15%). Patients were managed in the ED according to the severity of trauma. Most trauma patients were level 3 and severe trauma in 1.8% cases.

## Conclusion

An analysis of the trauma data showed that trauma in the pediatric population is preventable. The focus is to concentrate on community awareness to educate about the prevention of trauma in children. The trauma registry is in the process of completion and will be proposed to be applied to all regions of the NGHHA.

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# Intensifying the performance of the Code Blue Team in the pediatric emergency department - King Abdullah Specialized Children's Hospital

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## Background

The Pediatric Emergency Department in KASCH received 0.9% of code blue patients in 2017 and 0.6% in 2018, with a resuscitation success rate of 91% and 97%, respectively, for 2017 and 2018. The failure rate of resuscitation/code blue is not only dependent on the performance of the Code Blue Team, but is likewise attributed to the patient's condition and prognosis. The Code Blue Team's dedication and efforts are geared towards saving the life of the patient. All the resuscitation attempts/code blue events were audited by a dedicated Code Blue Observers Team in order to identify areas for improvement. A few improvement areas were noted during the actual codes and these are the bases of this study. Pediatric resuscitation occurs mostly because of respiratory arrest rather than cardiac arrest. Pediatric resuscitation for an arrested child is initiated even though there is profound evidence of no sign of life unless it is stated that the child is a "NO CODE Status". When there is no proper coordination or teamwork, or when there is a delay in management by the code team, it can result in a failed resuscitation.

## Methods

A team of expert nurses from the Pediatric Emergency Department convened, discussed, brainstormed, and analyzed the root causes of the resuscitation delay or failure in the pediatric emergency. This QI Project was named as Code Blue QI Team, and aimed to improve the performance and proper documentation during a code. An audit tool was created and the codes were audited. Alongside the Code Blue QI Project, the KASCH Code Blue Team conducts regular audits on the actual resuscitation procedure in the Resuscitation Unit.

## Results

Comparison of the actual codes performed in 2017 and 2018 was recorded. There was a total of 32 codes in 2017 and 26 in 2018. The response time was noted to be excellent in both years as the responders were able to initiate BLS in due time; however, a significant improvement was noted in 2018 from arrest time to first dose of epinephrine.

## Conclusion

Action plans were taken to solve the problems encountered during the codes, such as staff not being clear in their roles and responsibilities, team members not collaborating and communicating clearly, and physicians deviating from the American Heart Association guidelines. Improvement was noted after this timeframe, whereby the percentage of successful codes increased.

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# Reducing IV infiltration and potential harm in the pediatric emergency department - KASCH

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## Background

There was a significant increase in intravenous (IV) infiltration in the month of March 2016 in the Pediatric Emergency Department - KASCH. The Acute Care team noted an increase in IV-related incidence and there were 30 generated safety reporting system (SRS) reports from January to March 2016. This prompted the unit leaders to create a taskforce in order to review the causes and the factors leading to incidence and causing patient harm.

## Methods

Using the PDSA (plan-do-study-act) quality model, the quality improvement team collected data generated through the SRS on IV infiltration/extravasation. The reports were analyzed as to the causes and harm of the incident. Using a cause and effect diagram, the team identified the root causes as non-adherence to the insertion and sterility technique, staff competency on IV insertion and monitoring, type of dressing used, lighting, and lack of guidelines to support the practice. In order to draw a reliable conclusion, several PDSA cycles were tested and implemented: (1) data collection and audit tool design; (2) staff education and standardized documentation; (3) formulation of the escalation process and guidelines; and (4) continuous monitoring and auditing of IV infiltration/extravasation and regular reporting to the daily key performance indicator (KPI).

## Results

For the initial throughput of the project, the IV Watchers on the Move Team noted a marked decrease in infiltration in August 2018 as evidenced by the nurses' compliance in IV infiltration prevention strategies - i.e., (1) hourly IV site checks, (2) mandatory use of smart pumps, and (3) timely and accurate documentation of IV assessment.

## Conclusion

The IV Watchers on the Move QI Project was able to design a mechanism to reduce the potential harm caused by infiltration. Part of the intervention was the hourly assessment and early recognition of impending infiltration. Nurses were instructed to be cautious when administering highly concentrated medications. With all of the efforts and initiative shown throughout, the pediatric patients benefited from the successful interventions that finally led to the safe delivery of nursing care.



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# Effectiveness of procedure explanation in reducing anxiety for patients undergoing magnetic resonance imaging

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## Background

Magnetic resonance imaging (MRI) is potentially considered as the greatest invention in the world. In addition, all the people in the medical field have been surprised by the capability of MRI in the past 25 years. There has been a massive increase in the use of MRI in the clinical field. More than 80 million MRI procedures occur every year around the globe. Patients who are undergoing MRI examinations infrequently experience anxiety as a consequence of the procedure or the environment. Reducing patient anxiety is considered as one of the most common concerns affecting the outcome of the MRI scan. The purpose of this study was to investigate the effectiveness of procedure explanation on controlling anxiety levels in adolescent patients undergoing MRI.

## Methods

The Institutional Review Board (IRB) ethics committee approved this cross-sectional study. Convenient sampling techniques were used to select 37 adolescent patients (19 female and 18 male) who attended the MRI appointment unit at the Medical Imaging Department of King Abdulaziz Medical City, Riyadh, Saudi Arabia. Three tools were used to collect data: the sociodemographic data sheet, patient assessment knowledge sheet, and the State-Trait Anxiety Inventory (STAI) questionnaire. STAI is a self-report test designed to measure patient anxiety level; 40 questions are divided into two subcategories; 20 state (defined as fear, nervousness, discomfort, etc. and how the person feels right now), and 20 trait (defined as stress, worry, discomfort, etc. that the person experiences on a daily basis).

## Results

The state anxiety level showed a statistically significant difference in patients' knowledge between the pre-test and post-test with or without instruction. For the group with instruction, their anxiety level significantly reduced. The trait anxiety level showed no significant difference between pre-test and post-test with or without instruction.

## Conclusion

Because of lack of awareness about the procedural instructions for the patient before undergoing MRI, it may affect the procedure prognosis and outcome. Our suggestion for the future is to increase awareness about MRI and to improve communication skills of MRI staff to educate the patient in a good way to reduce patient anxiety.

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# Creating a culture of “excellent patient experience”: our experience at the Medical Protocol Department - King Abdulaziz Medical City, Riyadh

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Ministry of National Guard Health Affairs

## Background

Patient experience (PE) reflects interactions and occurrences/events across the continuum of healthcare. It is an important quality indicator that goes beyond the perception of excellent clinical care alone and even beyond patient satisfaction or its surveys. The purpose of this study was to see where we stand after starting PE culture, and to gain an insight into the problems we face daily during our rounds towards improving PE. Our aim was to identify, monitor, and analyze problems and correct them to improve the overall positive patient experience.

## Methods

- (1) Formation of a team with six to seven members, comprising PE-Director/Deputy Director (PED), two PE-Managers (PEMs), two PE-Nurses (PENs), one Document Controller.
- (2) Inpatient rounds were done daily to understand the problems.
- (3) Daily filling up of checklists under the “five domains” of PE: access and waiting, etc.

## Results

The time periods were: (1) before starting PE rounds, January 2016 to February 2017 (14 months; 663 patients); and (2) after starting PE rounds, April 2017 to May 2018 (14 months; 719 patients). Three parameters were considered for comparison.

- (1) Medication administration errors: before PE rounds - 30; after PE rounds - 16.
- (2) Patient falls with and without injury: before PE rounds - 3 (injury) in 20; after PE rounds - 4 (injury) in 22.
- (3) Hospital-associated pressure infections (HAPI): before PE rounds - 19; after PE rounds - 15.

## Conclusion

The important finding noted in our study is that medication errors were drastically reduced by 47%, even though there were more admitted patients after starting the PE rounds. Falls increased slightly and reduction in HAPI was not significant. The other problems noted and improved upon were as follows:

- (1) Patients with diabetes were advised not to eat outside food.
- (2) The gaps in communication between the patients/attenders and staff and between the hospital staff were lessened.
- (3) Delays in processing of procedures were lessened.
- (4) Patients felt free to discuss their issues/concerns.
- (5) Follow-up within 7-10 days after inpatient discharge is more organized.
- (6) More medication reconciliation is now being done.
- (7) Timely medical consultations were arranged for post-surgical patients to prevent complications.
- (8) Noise pollution by staff/others was decreased.
- (9) Cleanliness in rooms/washrooms was improved.

The significance of PE rounds is that they have been shown to result in reduced readmissions, morbidity, and mortality.

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# Successful improvement in post-exposure outcomes among healthcare workers exposed to vaccine-preventable diseases in a hospital setting

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## Background

Healthcare workers (HCWs) working in hospitals are at higher risk of exposure to patients with different infectious agents, particularly measles, mumps, rubella, and varicella. Identifying the HCWs who are at risk and initiating post-exposure management is critical to reduce the risk of further spread to other patients and HCWs. This is especially important in high-risk hospital areas such as emergency departments. The objective of the current study was to assess the impact of a multi-partner intervention on the outcomes of post-exposure management.

## Methods

All exposed HCWs working in King Abdullah Bin Abdulaziz Specialized Children's Hospital exposed to measles, rubella, mumps, and varicella during 2017 and 2018 were identified through active investigation and passive reporting. A multi-partner intervention was done during December 2017 to reduce the risk and outcome of exposure. Immune status of exposed HCWs as previously documented in the electronic records was evaluated. Those who were not sufficiently immune were given the relevant vaccine (MMR or varicella). Group and individual education was done to increase the awareness of HCWs. Engagement of departmental heads and nurse managers was pursued to encourage compliance. The outcomes of post-exposure management were compared before (2017) and after (2018) starting the intervention.

## Results

A total of 213 HCWs were exposed to the targeted infectious diseases (97 in 2017 and 116 in 2018). Of 213 HCWs, 41.3% were exposed to varicella, 41.3% to mumps, 8.9% to measles, and 8.5% to rubella. Compliance with post-exposure evaluation improved from 74.5% in 2017 to 95.0% in 2018. Although more HCWs were exposed to one of the above diseases in 2018 compared with 2017, the immune status of HCWs significantly increased from 69.4% in 2017 to 91.7% in 2018 ( $p < 0.001$ ). Cleared HCWs increased from 68.2% in 2017 to 90.1% in 2018 ( $p < 0.001$ ). Those who were granted sick leave decreased from 2.3% in 2017 to 0.7% in 2018 ( $p = 0.573$ ).

## Conclusion

A post-exposure intervention including immunization and awareness was successful at improving immunity and return to work rates, and reducing the need for sick leave. This intervention needs to be continuously implemented, especially in high-risk locations such as emergency departments. This can probably increase the safety of the work environment and reduce related absenteeism.

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# Analysis of dose variation between computed tomography (CT) follow-up studies performed in multidetector CT scanner

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## Background

Computed tomography (CT) is a radiological examination used to obtain cross-sectional images of human body parts. Multidetector-row CT (MDCT), also known as multislice CT, multidetector CT, or multisection CT, is the latest breakthrough in CT technology. It is considered an essential component of the pre-procedural and post-procedural evaluation. However, the primary concern with rising use of frequent and repeated CT studies in such patients is the associated dose of ionizing radiation and consequent potential risk of developing cancer later in life. Careful selection of CT scan parameters is essential to optimize imaging protocols to generate diagnostic-quality CT images with the least radiation exposure to meet the "as low as reasonably achievable (ALARA)" principle. To reduce the potential risks related to radiation exposure, different techniques have been established to minimize the radiation dose of CT imaging. However, between follow-up examinations, small differences in the patient's positioning as well as in the positioning and length of the scan are unavoidable, so that the conditions of follow-up examinations are never one hundred percent identical even when all general scan parameters are kept unchanged and the same CT scanner is used. This study aimed to investigate the dose variation between follow-up CT examinations performed on the same scanner with a fixed scan protocol at King Abdulaziz Medical City (KAMC), Riyadh, Saudi Arabia.

## Methods

The Institutional Review Board (IRB) ethics committee approved this retrospective study. We extracted, compiled, and analyzed data on volume CT dose index (CTDI<sub>vol</sub>) and dose-length product (DLP) for 200 patients (114 male, 86 female) who received two follow-up CT examinations of a non-enhanced scan of the chest (CH-CT) and abdomen (AB-CT), performed at the workstations at the Medical Imaging, CT unit, MNGHA-KAMC. Each examination was performed on the same scanner equipped with automated exposure control.

## Results

The median percentage difference in DLP between follow-up examinations was 7.6% for CH-CT and 8.2% for AB-CT. Similarly, the median percentage difference in CTDI<sub>vol</sub> was 5.5% for CH-CT and 4.5% for AB-CT. The maximum difference in DLP between follow-up examinations was 55.2% for CH-CT, 45.6% and 66.4% for AB-CT; the maximum difference in CTDI<sub>vol</sub> was 52.8% for CH-CT and 48.7% for AB-CT.

## Conclusion

There was significant variation in the radiation dose among the CT follow-up examinations performed in the same CT scanner with the same imaging protocol.

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# Consumption of raw milk is the main cause of brucellosis in the National Guard population at Riyadh: time to correct the misconception

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## Background

Human brucellosis is one of the most common communicable diseases in Saudi Arabia. It affects a large number of the population and causes high morbidity, mortality, and healthcare cost. People usually get the disease after exposure to infected animals or animal products contaminated with the bacteria. A significant steady increase in the number of brucellosis cases reported to the National Guard Hospital in Riyadh has been noticed during the past 5 years. The number of cases increased from 301 patients in 2013 to 449 patients in 2017.

## Methods

Serology and microbiology results of new brucellosis diagnoses are reported weekly to the public health section of the Infection and Control Department, National Guard Hospital, Riyadh. In response to the increasing number of cases of brucellosis, patients that were reported in 2017 were contacted by phone to assess the method of transmission and to refer family members with suspected exposure to the infectious disease clinic.

## Results

A total of 449 patients with newly diagnosed brucellosis have been contacted. Approximately two-thirds of the patients were male (67.7%) and the average age was  $41.3 \pm 21.7$  years. The highest number of reported patients was observed in October ( $n=57$ ). Almost all patients had Saudi nationality (99.8%). For the exposure history, the most frequent exposure was drinking raw milk ( $n=390$ , 86.9%). Approximately 10.9% of the patients had a history of animal exposure during the past 6 months. Approximately 2.2% of the patients denied all possible exposures.

## Conclusion

Drinking raw milk is still the most frequent exposure among patients with brucellosis reported to the National Guard Hospital in 2017. There is an urgent need for a more effective health education campaign that puts into consideration the cultural part of the problem. Multiple partners should be engaged including public health, Ministry of Agriculture, media, and community and religious leaders.

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# Prevalence and risk factors of gestational diabetes mellitus among pregnant patients attending National Guard Primary Healthcare Centers in Jeddah city

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## Background

Gestational diabetes mellitus (GDM) is defined as glucose intolerance with onset or first recognition during pregnancy, and is usually screened for at 24-28 weeks of gestation. Risk factors that have been identified include persistent glucosuria, history of macrosomic fetus, obesity, age older than 25 years, congenital malformations, and strong family history of type 2 diabetes, which is a common illness in our country. In our study, we estimated GDM prevalence and evaluated its risk factors among female patients attending National Guard Primary Healthcare Centers in Jeddah city in 2017.

## Methods

This was an observational cross-sectional study. Our sample size was calculated to be 347. We included all pregnant females, aged 15-45 years, who attended National Guard Primary Healthcare Centers in Jeddah, and had been following up there during the study period. We collected data from antenatal visit notes, and labor and delivery sheets using the electronic file system BestCare. Screening for GDM at 24-28 gestational weeks was done using the American Diabetes Association (ADA) two-step approach, starting with 1 hour 50 g glucose challenge test, followed by 3-hour 100 g glucose tolerance test. We used SPSS 24.0 to analyze data.

## Results

The prevalence of GDM among our population was calculated to be 19.6%. Glucose challenge test was abnormal in 36.6% (n=127) of the sample, and 6.9% (n=24) had diagnostic value. Glucose tolerance test was abnormal in 18.7% (n=65) of the sample, and 15% (n=52) had diagnostic value. Several factors were significantly associated with GDM including age ( $p<0.001$ ), height ( $p=0.028$ ), and body-mass index (BMI;  $p=0.045$ ).

## Conclusion

Prevalence of GDM is considered high among our population. Dietary habits and high BMI play an important role in the increasing amount of GDM cases. It is important to prevent GDM to minimize risks for both the mother and fetus.

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# Clinical indications of high-sensitivity troponin I orders in emergency departments

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## Background

Some molecules can be detected in the bloodstream after cardiac muscle damage, and are used to diagnose acute chest syndrome (ACS), such as high-sensitivity troponin I (hs-TnI). As ACS is an emergency and a major cause of death, physicians sometimes tend to overuse this investigation. Therefore, in this study, we aimed to make a clinical pathway that helps physicians know whether hs-TnI order is required or not.

## Methods

This study was a retrospective cohort study performed at King Abdulaziz Medical City, National Guard, in Jeddah, Saudi Arabia. The study period was between January 2017 and October 2017. We collected data about patients' demographics, risk factors, level of hs-TnI, chief complaint, and diagnosis. Demographics were age, sex, and body-mass index (BMI). Risk factors were dyslipidemia, hypertension (HTN), and diabetes mellitus (DM). Simple descriptive statistics were used for demographics to describe the sample features. The patients were divided into two groups based on their final diagnoses. The first group included patients with ACS, and the second group included patients without ACS. The characteristics of patients in each group along with their clinical presentations were analyzed and identified.

## Results

During the study period, there were 20,735 hs-TnI orders. We collected data for 1035 orders, of which 904 (87.34%) were eligible for the study. Reasons for exclusion were unregistered weight, height, or age, and hs-TnI ordered outside of the emergency room setting. Of 164 patients who presented with chest pain, only 48 had ACS. Patients who presented with chest pain and had dyslipidemia were at risk of 2.01 to develop ACS compared with those who did not have dyslipidemia ( $p=0.051$ ). There were 22 patients who had ACS without presenting with chest pain; most of them had DM and HTN. The risk of DM patients having ACS without having chest pain was 6.76 ( $p=0.095$ ), while HTN patients were at risk of 5.97 ( $p=0.064$ ). In fact, all patients diagnosed with ACS without chest pain had both DM and HTN, apart from two patients who had neither. The risk of having ACS if a patient had both DM and HTN and presented without chest pain was 8.77 ( $p<0.001$ ).

## Conclusion

Certain features, such as demographics, DM, and HTN, can be used along with the presenting complaint to suspect or exclude ACS rather than over-ordering hs-TnI in emergency rooms.

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# The impact of collaboration between physicians, nurses, and clinical pharmacists in reducing medication prescribing errors in King Abdullah Specialized Children's Hospital ER

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## Background

Medication errors remain the leading cause of mortality and morbidity in the pediatric emergency room (ER) across the world. The Institute of Medicine (IOM) has noted that this is due to the unique needs of the pediatric population compared with adults. With the introduction of the Computerized Physician Order Entry (CPOE) system in the National Guard Health Affairs (NGHA), there was a decrease in medication errors resulting from prescription. Inevitably, the CPOE did not eliminate all prescription errors. The King Abdullah Specialist Children Hospital Emergency Department reviews all safety reports (SRS) as part of the daily key performance indicators meeting with the ER Chairman, nurse managers, and charge nurses. The SRS report from 2016 showed a total of 102 errors. Medication administration is a process that commences with prescription by physicians, then dispensing by the clinical pharmacists, and finally administration by nurses. The NGHA adheres to the "swiss cheese model" recommended by its Safety Medication Program; therefore, the majority of these errors were "near miss", meaning they were caught in the process before reaching the patient. The aim of this project was, therefore, to reduce the rate of prescription errors by 60% by the end of 2018.

## Methods

This project was done in the KASCH Emergency Department with a total of 65 beds. Total visits can be up to 500 patients in 24 hours, especially during the winter season. PDSA (plan-do-study-act) methodology was applied in this quality improvement project. A collaborative team was formed led by the ER Chairman. A series of meetings were held. Cycle 1: team formation, brainstorming, and data validation and analysis. The following themes were identified: dose incorrect, frequency incorrect, and allergy override. The following medications were also identified with frequent errors: paracetamol, dexamethasone, and antibiotics. Cycle 2 focused on establishing order sets, pre-calculated prescription doses based on weight on BestCare. Cycle 3: allergy awareness campaign to all clinicians. PDSA 4 focused on the accuracy of reporting errors follow-up and action plans to be implemented and documented.

## Results

The overall results showed that there were 28 ER prescription errors in the year 2018 compared with 102 in 2016, reflecting a reduction of 73%.

## Conclusion

The success of this project was evidence that collaboration among all clinicians involved in medication administration can greatly decrease medication errors. This project aims to spread to all areas of KASCH to address the challenge of medication errors.



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# Outbreak of measles and mumps in the National Guard population in Riyadh, 2018

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## Background

Measles, mumps, and rubella (MMR) vaccine is a safe combined vaccine that is considered one of the most effective protective measures against three separate diseases: measles, mumps, and rubella (German measles). During 2018, there were reports of an increased number of measles cases in Saudi Arabia and globally. The objective of the current study was to confirm the presence of such an increase among the National Guard population and to assess if mumps and rubella were also affected.

## Methods

Communicable diseases are regularly reported from the National Guard population in all regions to the public health section of the Infection and Prevention Control (IPC) department at Riyadh. Retrospective review of prospectively collected information about the three diseases prevented by MMR was conducted in 2019. This covered the period between 2008 and 2018.

## Results

During the study period, a total of 48 patients with measles, 84 with mumps, and 20 with rubella had been reported to the IPC department. Compared with the previous 10 years, the number of patients with measles increased from an average of 3.7 to 11 (197% increase). Compared with the previous 10 years, the number of patients with mumps increased from an average of 5.6 to 28 (400% increase). Compared with the previous 10 years, the number of patients with rubella increased from an average of 1.8 to 2 (11% increase).

## Conclusion

We are confirming an outbreak of both mumps and measles. This may indicate that the increase is related to a problem with MMR coverage or effectiveness. Further research is required to confirm the possible causes of this outbreak: missing immunization, shortness of vaccine, misconception about the link between the MMR vaccine and autism, vaccine-induced disease, and pockets of unvaccinated immigrants. Additionally, there is an urgent need to increase public awareness of the MMR vaccine.

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# Improvement in the outcome of the Viral Hepatitis Prevention Program at National Guard Hospitals (Riyadh) in 2018

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## Background

The public health team of the Infection Prevention and Control (IPC) department conducted a systemic evaluation in 2017 for patients diagnosed with hepatitis B or C between 2013 and 2016. The findings showed high rates of loss to follow-up and unreachable viral hepatitis B and C infected cases. Loss to follow-up has been shown to be a major obstacle for management of patients with hepatitis. The objective of the current study was to improve the rate of case identification and follow-up management.

## Methods

To improve the rate of case identification and follow-up management, the guidelines for viral hepatitis were upgraded in 2018 by IPC staff after active engagement of head and treating physicians of relevant departments and hospital executives. Additionally, key performance improvement (KPI) metrics were established: loss to follow-up (unable to reach patient) and increase in management initiation (able to reach and counsel patient). Data for patients with positive HBsAg and HCV PCR were collected in 2018 using the hospital electronic record system. In addition to enhanced counselling and referral of infected patients, an annual viral hepatitis awareness campaign was done during the International Hepatitis Day to raise public awareness about vaccination and treatment for viral hepatitis.

## Results

Hepatitis B management initiation increased from 67% during 2013-2016 to 94% during 2018, and patients lost to follow-up decreased from 33% to 6%. Similarly, hepatitis C management initiation increased from 67% during 2013-2016 to 86% during 2018, and patients lost to follow up decreased from 33% to 14%.

## Conclusion

Enhanced counselling and referral of infected patients, and increasing public awareness were successful in improving the initiation of case management and reducing loss to follow-up for patients with hepatitis B and C. The intervention focused on engagement and use of the hospital electronic record system in improving the public health role of the IPC department. More efforts are still required to reduce the number of patients lost to follow-up.

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# The impact of standardization of intravenous line change frequency in promoting patient safety and cost containment

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## Background

Intravenous (IV) line infections still remain the leading cause of morbidity in all healthcare institutions and the cost of treating them is increasing worldwide. In 2011, the Centers for Disease Control and Prevention (CDC) developed guidelines intended to provide evidence-based recommendations for prevention of IV line-related infections. Category 1A stated that in patients not receiving blood, blood products, or fat emulsions, administration sets are to be replaced no more frequently than at 96-hour intervals, but at least every 7 days. The National Guard Health Affairs (NGHA) launched a 5-year fiscal plan and one of its objectives was to maintain financial sustainability without compromising care, but the 2017 financial report indicated that a total of more than 8 million Saudi riyals were spent on IV primary lines only. This project was done in the NGHA Central Region, which comprises two hospitals, namely King Abdulaziz Medical City (1171 beds) and King Abdullah Specialist Children's Hospital (600 beds). A collaborative team was formed comprising nurse managers, nurses, nursing product representatives, infection control practitioners, and patient care technicians from both KAMC and KASCH. The aim of the project was to standardize the frequency of line change and decrease the amount spent on IV lines by 30% by the end of the year 2018.

## Methods

Focus PDSA was the improvement methodology applied. PDSA 1 was the team formation, brainstorming, and cause and effect analysis using a fishbone diagram and Pareto chart. The following topics were highlighted: (1) no standardization of frequency of changing lines between units; (2) lack of awareness regarding cost containment; (3) misconception regarding the fact that frequency of changing lines prevents infection; and (4) issues related to product availability. Based on these findings a DPP was formulated with an appendix of IV line changes, which was implemented in all nursing units in the Central Region. Staff education and awareness sessions were conducted throughout the Central Region.

## Results

The results show an amount of more than 3.6 million Saudi Riyals was saved in the year 2018.

## Conclusion

The project is in its sustainability phase, where it is aiming to utilize the consumable dashboard to monitor use and cost of IV lines. The revised DPP is being submitted as an APP to be a reference to all NGHA regions. The motto "reduce the cost but not the care" has been adopted by all clinicians.

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# The prevalence of occupational injuries among Saudi Red Crescent pre-hospital care providers in Jeddah, Saudi Arabia, 2018

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## Background

Pre-hospital care providers were at higher risk of occupational injuries than other medical care providers because of the workplaces and situations they usually deal with. Through observations and repetitive visits to the Saudi Red Crescent Authority (SRCA) stations, the issue was outlined and identified. The sample was collected from SRCA, which is the main emergency medical services authority providing care for patients outside the hospital environment. The pre-hospital care providers in SRCA are divided into three groups: physicians, paramedics, and emergency medical technicians (EMTs). In Saudi Arabia (SA), no studies had been done on pre-hospital occupational injuries; however, some studies on this topic have been done around the world. The aim of this study was to identify the prevalence and risk factors of occupational injuries among SRCA pre-hospital care providers in Jeddah, SA.

## Methods

A cross-sectional study was done using an online questionnaire (Google Forms) to obtain demographic and occupational injuries-related information from 217 SRCA pre-hospital care providers. The sample was collected using a 95% confidence level and 5% margin of error, which was derived from the population number (n=495) of SRCA pre-hospital care providers in Jeddah, SA.

## Results

After the calculations, the study showed a high prevalence of occupational injuries of 52.5% among 137 EMTs, 51 paramedics, and 29 physicians. Participants had an average of 6.63 years' experience. Back-related injuries were the most common type of injury, resulting in 60 cases among 114 injured participants. Work stress was considered the most common estimated risk factor based on the participants' questionnaire, with 64 cases. Additionally, no significant difference was found using T-test and Chi-squared test to compare age and experience with different types of occupational injuries.

## Conclusion

Despite the study's limitations, which affected its accuracy, the study showed a high prevalence of occupational injuries among SRCA pre-hospital care providers in Jeddah, SA. One of these limitations was a small sample size resulting from communication barriers with SRCA. Occupational injuries that affect pre-hospital care providers may reduce the effectiveness of a patient's health and safety. Future studies should identify and evaluate prevention strategies to increase public health awareness in the pre-hospital setting by highlighting the relationship between healthcare occupational injuries and patients' outcomes and safety.

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# The practice and attitude of healthcare workers towards stethoscope cleaning: a patient safety quality improvement project

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## Background

Healthcare-associated infections constitute a major health concern for hospitalized patients. Contaminated stethoscopes may be a potential source for the spread of microorganisms. The aim of this study was to determine the current attitude and rate of stethoscope cleaning as well as the level of contamination of stethoscopes, followed by the implementation of a patient safety quality improvement project.

## Methods

A prospective study was performed at King Abdulaziz University Hospital. Our study ran through four main phases. In the first phase, healthcare workers (HCWs) were observed throughout the medical wards to determine their attitudes towards stethoscope cleaning. During the second phase, random stethoscope swabs were taken for culture to determine their contamination rate; afterwards, a questionnaire was distributed among the HCWs to identify stethoscope cleaning barriers. In the third phase, an awareness day was scheduled to demonstrate the importance of stethoscope cleaning, and cleaning materials were made accessible. In the fourth phase, we estimated the impact and effectiveness of the intervention by observation of HCWs. Descriptive statistics were applied. All data were analyzed using Microsoft Excel sheets.

## Results

In the observational phase, only 16.7% of 155 HCWs cleaned their stethoscopes between patient encounters. Among the 155 HCWs who participated in the survey, 25% reported that they never cleaned their stethoscopes, 33.5% had difficulty finding cleaning materials, 18.7% thought cleaning isn't necessary, 93.4% reported that they would clean their stethoscopes if the wipes were accessible, and 21.3% cleaned their stethoscopes regularly. Among the 39 stethoscope sterile swabs taken, the mean growth on blood agar was 245 colony-forming units (CFUs;  $\pm 64$ ). In the post-intervention observational phase, 65 HCWs were observed, of whom 70.1% cleaned their stethoscopes ( $p < 0.01$ ).

## Conclusion

Most HCWs do not clean their stethoscopes between patient encounters. Raising awareness and providing appropriate cleaning materials are effective interventions to increase the rate of stethoscope cleaning among HCWs.

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# The use of 5S methodology in improving working efficiency in the labor and delivery unit, King Abdulaziz Medical City - Jeddah

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## Background

The project was done in the Labor and Delivery Suite of King Abdulaziz Medical City-Western Region. There was no dedicated storage space for supplies and equipment. There was difficulty in monitoring par level and expiry dates. Unneeded supplies and equipment were taking up much needed space. It was difficult (and time consuming) to find supplies, especially during an emergency, because it was disorganized (e.g., IV tubings mixed with PPE). Staff that were floated in usually faced difficulty in finding supplies. This project was initiated to identify ways and means of using the limited space in the unit efficiently, by removing inappropriate items and organizing items by priority.

## Methods

The team used the 5S methodology. This is a management tool within the Lean paradigm intended to optimize productivity and eliminate waste. 5S is derived from five Japanese terms beginning with the letter S:

- Seiri (sort or organize)
- Seiton (set in order)
- Seiso (shine)
- Seiketsu (standardize)
- Shitsuke (sustain).

Seven teams were formed. Each team member went around the workplace and identified supplies and equipment that were not needed. Supplies were categorized into groups. Designated storage areas were identified for supplies and equipment and were identified as Zones. Consumable items were grouped into eight categories and color-coded. Equipment and furniture in need of repair was sent for repair. Any items that were not needed were removed from the workplace.

## Results

Following the implementation of the project, a decrease in the ordering of supplies was noted. All the supplies were standardized and well labeled. This enable the staff to easily monitor the par level, FIFO, and expiry dates. There was a time reduction in locating supplies, especially for float staff. Utilization of space was maximized. There was improved teamwork among the staff and increased efficiency.

## Conclusion

5S can be applied to healthcare services with beneficial effects such as cleaner, organized, efficient workplaces for enhanced safety and increased productivity, and reduction of inventory and supply cost. Continuous monitoring will be done to sustain gains.

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# Improving starting time for first operating room (OR) cases in the main OR

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## Background

According to the Safety Reporting System (SRS), there is 54% compliance for the first OR cases to start on time. An analysis from the OR Benchmarks Collaborative (ORBC) shows the median for the on-time start for first cases is 64.3%. This study was conducted by a multidisciplinary team involving the Surgery Department and Nursing Services. The study includes patients admitted to the surgical unit for an elective procedure inside the main OR. The aim of the study is to increase the compliance rate for the start time of the first OR cases in the main OR from 54% to 80% by the end of April 2019, by adhering accurately to the OR start time of 0800 h for all cases coming from the surgical ward.

## Methods

A 5-month retrospective study was done by analyzing the generated SRS for the delayed cases. Upon analysis, six reasons were identified. After which, we utilized a Pareto chart to look at the frequency of occurrence for each reason. The outcome measure is the percentage of compliance to the start time of the first case in the main OR at 0800 h. Process measures include the average time needed for preparing patients for surgery in the surgical unit, average time of bringing the patient to the main OR, average time of nursing hand-over and sign-in of the patient in the holding area, completion of consent, and the average time of on-site arrival of surgeons and anesthesiologists. The balancing measure is OR staff average time working hours. A PDSA (plan-do-study-act) cycle was formulated which focused on the pre-operative team and preparing the patient a day prior to the procedure. The PDSA was tested and implemented for a pilot study of 2 weeks and is currently running on its third month of implementation.

## Results

After implementation of PDSA, the 2-week pilot study achieved a compliance rate of 89%. The compliance rate for February 2019 is at 97%.

## Conclusion

The project is largely successful due to continuous and effective monitoring. In the future, we seek to organize a Perioperative Committee that will evaluate the patient flow from ward to OR. Furthermore, we aim to expand the project to other units such as Day Surgery and the Endoscopy Unit, and areas that are sending patients to the OR. Ultimately, the overall conclusions are preventing delays of other scheduled cases, improving patient satisfaction, and improving the utilization of OR time.

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# Optimizing appropriate documentation of venous thromboembolism (VTE) risk stratification and assessing current VTE prophylaxis prescription

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## Background

The aim of the study was to examine the gaps in documentation of VTE risk stratification scoring according to the Padua score in the electronic medical record (BestCare system) for medically admitted patients, and to identify the current practice of VTE prophylaxis according to any guidelines in use.

## Methods

A concurrent cohort of all patients admitted to the Internal Medicine Department was studied from 1 September to 30 November 2018 for the compliance of VTE prophylaxis documentation and VTE prophylaxis prescription. Data were analyzed in December 2018, a PDSA (plan-do-study-act) model was applied, and educational intervention through presentations and WhatsApp group notifications to the whole medicine team conducted. Monthly data collection was started from January 2019 onwards to identify the improvement after implementation of interventions in our practice. VTE prescription according to National Institute of Health and Care Excellence (NICE) clinical guidelines 2010 was added in BestCare as none existed.

## Results

A total of 405 patients were studied from 1 September to 30 November 2018. Compliance to Padua score documentation was 94% (n=382). 67% (n=142) patients were at risk of VTE. Among these patients, VTE prophylaxis prescription was not done in 33%. After implementing interventions in our practice, prospective data collected in January-February 2019 showed significant improvement in complete and appropriate documentation of VTE prophylaxis to 99% and 98% VTE prescription according to NICE clinical guidelines 2010. Monthly data will be collected on a regular basis to ensure compliance.

## Conclusion

The VTE risk stratification documentation and VTE prophylaxis prescription showed promising results after PDSA implementation, introduction of NICE clinical guidelines 2010, and educational interventions. This change has shown an improvement in patient quality of care and safety outcomes.



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# Improving overall compliance of CCU standard discharge medication

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## Background

Acute coronary syndrome (ACS) includes unstable angina, non-ST-elevation myocardial infarction, and ST-elevation myocardial infarction. ACS is a major cause of emergency care and hospital admissions. It is one of the leading causes of death. Early recognition and management planning for ACS is mandatory for best patient care. After successful management of ACS, patients have to be discharged with optimal guideline-directed medical therapy (GDMT). This GDMT is important not only for symptoms, but overall prognosis is also improved with use of GDMT. In July 2018, the team started monitoring compliance to medication discharge as per American College of Cardiology (ACC)/American Heart Association (AHA) guidelines for antiplatelets, beta-blockers, angiotensin-converting enzyme (ACE) inhibitors, statins, and mineralocorticoid-receptor antagonists (MRA). The baseline data showed 78% overall compliance. The team, formed by the Cardiac Science Division, Department of Medicine, Clinical Pharmacist, Nursing, and Quality and Patient Safety Department, started monitoring CCU medication discharge and aimed to improve compliance of CCU patients receiving standard cardiac medications upon discharge to 100%.

## Methods

The team implemented PDSA (plan-do-study-act) methodology and decided to create a set of standard discharge medications for ACS patients in the BestCare System. These included all five medications (antiplatelets, beta-blockers, ACE inhibitors, statins, and MRAs), which will prevent the chance of missing any medication.

## Results

The improvement was achieved during 3 months with an overall compliance rate for standard discharge medications of 97%.

## Conclusion

All patients admitted with ACS have to be on GDMT upon discharge. This is one of the key performance indicators and needs to be applied and monitored in hospital settings where cardiac patients are admitted and managed as ACS.

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# Adherence to screening guidelines for hepatitis and tuberculosis among HIV patients

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## Background

HIV is an infectious disease transmitted through blood or body fluids. The main cause of death for patients with HIV are opportunistic infections (OIs), since patients have a weakened immune system, leaving them susceptible to any infectious agent. OIs are becoming less frequent because of better immunity of HIV patients and earlier screening for OIs for treatment and prevention. As per international guidelines, it is recommended that patients with HIV are screened for hepatitis B, hepatitis C, and tuberculosis upon HIV diagnosis because of their frequent co-infection with HIV and similar route of transmission. However, gaps in screening for common co-infections still occur.

The aim of this study was to estimate the prevalence of hepatitis B, hepatitis C, and tuberculosis among HIV-positive patients, and to assess the adherence of healthcare workers to the screening guidelines of common HIV co-infections.

## Methods

This was a retrospective analysis of all HIV-positive patients diagnosed at KAMC-Riyadh from 2000 to 2018. Data regarding results of infectious diseases were extracted from each patient's medical file.

## Results

A total of 126 patients tested positive for HIV in KAMC-Riyadh during the study period. 53 of these patients were screened for hepatitis B, of whom four were positive; 55 were screened for hepatitis C, of whom four were also positive, and 72 patients were screened for tuberculosis, of whom seven were positive. The remainder of the patients were never screened for any of the diseases.

## Conclusion

More than 40% of patients with HIV were not screened for either hepatitis B, hepatitis C, or tuberculosis, which are the most common co-infections with HIV. These diseases may progress quickly and could be managed if discovered early or prevented. These results demonstrate the need for a comprehensive HIV program that involves early screening and protection against all infectious diseases.

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# Prevention of mother-to-child transmission of hepatitis B in King Abdulaziz Medical City, Riyadh

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King Abdulaziz Medical City

## Background

Hepatitis B continues to affect many people in Saudi Arabia, causing a huge burden on the healthcare system for treating patients and preventing spread of the disease. Because hepatitis B is not curable, transmission of infection can only be prevented by vaccinating those susceptible, paying special attention to children of positive mothers. Guidelines suggest that all infants born to positive mothers should receive both the hepatitis B vaccine and immune globulin within 12 hours of birth. In addition to the remaining two doses of the hepatitis vaccine, infants should also be tested for hepatitis B 3 to 6 months following the last dose of vaccine. The aim of this study was to identify if international guidelines were followed after delivery in hepatitis B-positive mothers at KAMC-Riyadh.

## Methods

This was a retrospective analysis of pregnant mothers positive to hepatitis B who gave birth in KAMC-Riyadh during 2016-2017. Data regarding administration of vaccine and immune globulin, completion of vaccine series, and follow-up testing were extracted from the child's medical record.

## Results

During the 2-year study period, a total of 105 hepatitis B-positive mothers gave birth, and all infants were administered the birth dose of the hepatitis B vaccine; however, only 55 children were documented to have completed the three-dose series of the vaccine. Only 101 infants were administered immune globulin after birth, and only two children were tested for the virus.

## Conclusion

Infants born to hepatitis B-positive mothers do not receive special attention or follow-up. It is not known why four infants did not receive immune globulin; however, unclear documentation of the virus in the mother's file during pregnancy or delivery may be a reason. Many of these children did not receive their full vaccine series and almost all were not tested for the virus. These numbers demonstrate the need for a strategic plan for the management and follow-up of infants born to hepatitis B-positive mothers.

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# Journey to CBAHI accreditation at National Guard Health Affairs

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## Background

MNGHA facilities have been accredited by the Joint Commission International (JCI) since 2006. Leaders in MNGHA believe that the accreditation process is a tool to improve the quality and patient safety in the hospital, applying evidence-based standards in performance with focus on the outcomes. A decision was made by the leadership to attain a national accreditation certificate (Central Board for Accreditation of Healthcare Institutions, CBAHI). In 2016, MNGHA facilities had the first experience with CBAHI through the ESR program. All facilities were visited by two surveyors to evaluate the compliance of MNGHA hospitals with 20 Essential Safety Requirements, as this was a national project to improve patient safety in all healthcare facilities in the Kingdom of Saudi Arabia. After this experience, MNGHA leaders were interested to submit all MNGHA facilities for a national accreditation represented by CBAHI in addition to international accreditation represented by JCI. All MNGHA facilities were scheduled for CBAHI accreditation in 2018, the Central Region in April 2018, Western Region in May, Al Ahsa in July, Dammam in August, and Madina in October, which was postponed to February 2019.

## Methods

A team consisting of 18 certified CBAHI surveyors was scheduled to conduct the mock survey for all regions at least 3 months prior to the real survey. MNGHA leadership fully supported the project by providing the required resources to achieve the desired outcome from the project.

## Results

All MNGHA facilities had their mock survey by the MNGHA's surveyors with excellent feedback with the following outcomes: tremendous learning opportunities were created during the mock survey, improve the intraregional interaction by sharing experiences, create a resource team in the system from different specialties for CBAHI accreditation. Common findings were identified among all MNGHA Regions, which led to some changes at the corporate level of MNGHA. Moreover, the impact of the project on the real survey of all hospitals was remarkable; the MNGHA's hospital scores were considered as extraordinary results:

Facility Score

KAMC - Central Region 96.40%

KAMC - Western Region 92.27%

KAH- Al Ahsa 94.66%

IABFH Dammam 96.75%.

## Conclusion

Building capacity is crucial in improving the system and process, utilizing local resources and appreciating staff skills and knowledge is the way to achieve the culture of a learning organization, connecting people from different systems and settings will create a culture of learning, sharing successful experiences of overcoming challenges standard with the same resources will highly impact a positive outcome in the real survey.

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# Saudi nursing students' attitudes towards patient safety and the influencing factors: a quantitative and qualitative study at the College of Nursing - Jeddah

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## Background

Patient safety becomes a challenging discipline in educational institutions and hospitals. As future nurses, it is expected that nursing students have sufficient knowledge and inspirational attitude towards promoting patient safety. The aim of this study was to assess the attitudes of Saudi nursing students towards patient safety at the College of Nursing - Jeddah, and to identify the factors that influence their attitudes towards patient safety.

## Methods

Mixed methods research was done using a concurrent triangulation design. An Attitude Towards Patient Safety Questionnaire was developed by the researchers and given to all nursing students (n=296) who enrolled in the academic year 2017-2018 to collect the quantitative data, while a qualitative investigation guided by in-depth interview was done with a purposive sample of 14 nursing students to identify factors influencing their attitudes towards patient safety. Appropriate statistical analysis was applied while qualitative data were analyzed by content analysis.

## Results

The present study concluded that Saudi nursing students manifested high and positive attitudes towards patient safety and indicated that their attitudes were not affected by the academic level or learning experience. "Teaching patient safety issues" scored as the highest dimension compared with "error disclosure and management dimensions", which rated as the lowest dimension of students' attitude. Many factors extracted from qualitative content analysis seem to influence students' attitudes towards patient safety, identified as facilitators or barriers and thematically categorized as "patient factors", "staff factors", and "work environment factors", with 25 subfactors under these themes.

## Conclusion

Nursing students should be supported by adequate training about safety measures to enhance their safety attitude, knowledge, and practice. Error reporting and disclosure culture should be a norm in nursing education and the healthcare environment. Therefore, students should participate in the process of error analysis and management with the provision of adequate clinical supervision. Various teaching-learning strategies including traditional teaching and problem-based learning should be integrated as instructional strategies by nurse educators for enhancing nursing students' problem-solving and critical thinking and to bridge the identified theory-practice gap.

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# Correlational study of perceived organizational empowerment and reported assertive communication skills among Saudi newly graduated nurses

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## Background

Being empowered and able to speak up against unsafe practice are key high-caliber skills for building a patient safety-oriented nursing workforce. There is little evidence in the literature that examines these two skills in the context of Saudi newly graduated nurses. The aim of this study was to examine Saudi newly graduated nurses' perceptions of organizational empowerment and of speaking up against perceived unsafe practice.

## Methods

A cross-sectional survey design was used. 143 questionnaires were distributed to Saudi newly graduated nurses from five publicly funded hospitals in the Eastern Province in Saudi Arabia. The nurses' level of perceived organizational empowerment was assessed using the Condition of Work Effectiveness (CWEQ-II) questionnaire and their Speaking up Scale attitudes were assessed using four clinically challenging hypothetical scenarios.

## Results

83 newly graduated nurses (58%) completed the questionnaire. The nurses reported a moderate level of both perceived empowerment and willingness to speak up against unsafe practice. There was a statistically significant correlation ( $r=0.24$ ,  $p<0.05$ ) between the participants' total structured empowerment score, and their speaking up score. Willingness to speak up was also correlated with the perceived access to support at work ( $r=0.321$ ,  $p<0.05$ ). Both the CWEQ-II and the Speaking up Scales were found to have moderate levels of internal consistencies.

## Conclusion

The findings underscore the need for supporting newly qualified nurses in developing their perceived empowerment and assertive communication skills. Nurse managers, educators, and peers must consider practical strategies to help build and sustain newly qualified nurses' perceived work empowerment and level of assertiveness. Further testing of the CWEQ-II and the Speaking up Scales is needed to fully establish the psychometric properties and reliabilities of these scales among the Saudi nursing workforce.

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# Improving x-ray utilization in ACC through a quality improvement approach - King Abdulaziz Medical City - Riyadh

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## Background

Adult Radiology faced different challenges in to how to improve the patient care experience by decreasing waiting times between requesting an x-ray and it being performed. It was suggested that service expansion could overcome the problem. The performance improvement team has been called to assess the needs as well as staff demands. In January 2018 the project took place in the medical imaging outpatient department. Timely, efficient, and safe care of patients required medical imaging services specifically to improve turnaround times leading to enhanced patient experience.

## Methods

The project focused on the ACC clinics, measuring the time from when the x-ray was requested to the time it was performed. The x-ray unit runs an average of 27,000 x-ray tests per year. A process map was done to analyze and help in identifying bottlenecks that are holding up processes and the gaps that are leading to operational problems.

## Results

The result shows the average x-ray sessions that have been done since 2008 (including business cases), the decrease in sessions in 2015 is due to KASCH Hospital, which moved the pediatric departments. For x-ray sessions in 2017 (23,448 in working hours and 1823 business cases), most of the x-ray sessions were done on Tuesday (28%), with fewest done on Thursday (10%). Upon analyzing the data, the calculated average patient waiting time was 22 minutes. Further analysis showed that 82% of patients had met the waiting time threshold, which is 30 minutes. The medical imaging unit located in the ACC building contains five x-ray rooms; 41% of all sessions in 2017 had been performed in room number 3.

## Conclusion

Based on the analysis, the team determined that the process is stable and predictable. However, there are several areas for improvement that we would recommend focusing on:

- (1) The distribution of the clinic during the week, Thursdays have the fewest clinics; therefore, it is the least utilized day.
- (2) The distribution of the rooms to perform x-ray sessions; room number 3 is used most out the five rooms (41%) and room 1 is used the least (11.76%).
- (3) Waste of requesting x-ray tests overall hospital. The team suggest establishing small projects to highlight and improve the previous areas and review current staffing and rostering allocations.

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# Developing a specialty-specific handoff tool: a national electronic Delphi study

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## Background

Handoffs at the end of clinical shifts are a daily routine in emergency department settings and are considered by most authorities as a common source of risk and potential harm to patients. There is a need to standardize the patient handoff process to reduce related human errors. This study aimed to use an electronic Delphi method to identify the core elements essential for an emergency department physician-to-physician handoff.

## Methods

Panelists were required to be board-certified emergency physicians with no less than 3 years of post-board experience. An electronic Delphi-style study was performed over four rounds. The first was to identify elements and categorize them into domains, and the remaining three to score and debate individual elements. Items were anonymously scored on how frequently each element was required during handoffs, from 1 "rarely required" to 10 "always required". Panelists were able to add and respond to arguments as well.

## Results

29 emergency physicians were enrolled in the panel and all panelists completed the entire Delphi process. The top five rated handoff elements were the chief complaint history, patient identification, clinical stability, working diagnosis, and consulting services involved. Panel scores showed less variability as rounds progressed and the final list of elements had a high reliability score (Cronbach's alpha 0.93).

## Conclusion

The study methods yielded an itemized and ranked list of elements that is easy to implement as a checklist or in forms and could be used to standardize patient handoffs by emergency physicians. Arbitrary cutoff values may be used to design a handoff tool based on the results of such studies. These cutoffs could help decide which elements to include or which elements may be mandatory in a proposed handoff tool. These methods may be adapted to develop standardized handoff frameworks that serve other specific disciplines or practice settings.





