I.S.E.E.

I Study. I Experiment. I Evaluate.

Research and Quality Symposium 2016

In conjunction with Quality Month 2016, and in collaboration with Allied Health, Medical and Nursing

CONTENTS

ACKNOWLEDGEMENTS

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Dr Lim Beng Leong, Emergency Medicine
Ms Prema Balan, Nursing
Dr Nitin Mahobia, Laboratory Medicine

Keynote Session

Opening Address

A/Prof Cheah Wei Keat

Chairman, Medical Board, Ng Teng Fong General Hospital

Keynote Session: Innovations in Population Health

A/Prof Josip Car

Director, Health Services Outcomes Research Programme, and Director, Centre for Population Health Sciences, Lee Kong Chian School of Medicine, Nanyang Technological University, Singapore

Keynote Session: Clinical Research for Busy Clinicians

A/Prof Teoh Yee Leong

Chief Executive Officer, Singapore Clinical Research Institute

Closing Address

Ms Chee Thong Gan

Group Director, Allied Health, Ng Teng Fong General Hospital

Research and Quality Symposium Synopsis

The Research and Quality Symposium 2016, held on 14th October 2016, was JurongHealth's inaugural symposium. The event was organised by the Clinical Research Unit in collaboration with Allied Health, Medical and Nursing Divisions, in conjunction with Quality Month.

The objective of the Symposium was to steer our researchers toward Research and Development projects that significantly improve the quality of health and healthcare delivery for our patients, and the community that we look after. This was further addressed by JurongHealth Chairman Medical Board, A/Prof Cheah Wei Keat, who opened the ceremony.

At the symposium, key speeches were delivered by experienced and excellent speakers from the Lee Kong Chian School of Medicine in Nanyang Technological University (NTU) and the Singapore Clinical Research Institute (SCRI). A/Prof Josip Car, the Director of the Health Services Outcomes Research Programme and Centre for Population Health Sciences at NTU, gave a talk on innovation in population health. He spoke about the impact of implementation science and eHealth on the future of healthcare. From SCRI, Chief Executive Officer A/Prof Teoh Yee Leong shared tips with busy clinicians on how to be an excellent researcher amidst a busy schedule.

To recognise the works of our fellow researchers, we held a Poster Exhibition to display all posters, including those that were competing in the Oral and Poster categories. The top Oral presenter was awarded $1,000 shopping voucher, while the first and second runners-up were awarded $750 and $500, respectively. For the Poster competition, the first prize was $300 shopping voucher, while the second and third prizes were $200 and $100, respectively. Tokens of appreciation were also presented to the Clinical Research Committee members for their contributions in promoting a sustainable research environment in JurongHealth.

The Symposium was closed by the Group Director for Allied Health, Ms Chee Thong Gan. She expressed her admiration for the researchers' dedication and encouraged greater progression of Research and Development in JurongHealth in the future.

Pre-Conference Workshop

OVERVIEW
Workshops were held on October 13, 2016, a day before the Symposium, with the purpose of enriching JurongHealth staff in research and development topics.

Time	Workshop	Venue	Speaker	Audience
0900–1230	Basic Data Management and Analysis	Excellence Room	Mr Johnny Wong, Executive, Clinical Research Unit	JurongHealth staff
0900–1030	Academic Writing: Abstract	Openness Room	Ms Maleena Suppiah Cavert, Assistant Director, Clinical Education Office	JurongHealth staff
1100–1230	Concept and Dissemination of Research	Openness Room	Dr Muhammad Rahizan Zainuldin, Principal Physiotherapist, Physiotherapy	JurongHealth staff
1330–1600	Nursing: Building Capacity for Clinical Quality	Learning Centre	Dr Emily Ang, Professor and Head, Alice Lee Centre for Nursing Studies, Yong Loo Lin School of Medicine, National University of Singapore	Nurses and JurongHealth staff

Basic Data Management and Analysis

This workshop aimed to equip participants with a basic understanding and skillsets needed for data management and analysis in Microsoft Excel. Participants learnt to create standardised data collection templates, clean up and format raw data, and tried out exploratory data analysis with the use of tables and charts. Helpful tips on using Excel, such as conditional formatting, data validation, data filters and pivot tables were shared. At the end of the workshop, participants should have the confidence to use Excel for data management and descriptive analysis.

Academic Writing: Abstract

This workshop aimed to equip participants with the skills to write an accurate representation of their research project, which comprises title, authors, background, aim, methods, results and conclusions/impact of the study.

Concept and Dissemination of Research

At the end of the session, the participants will be able to: (a) list the acceptable standards in the different modes of presentation; (b) understand the requirements of different formats of presentation; (c) identify pitfalls in presentation; and (d) demonstrate ways of improving presentation.

Nursing: Building Capacity for Clinical Quality

In this workshop, the talk, 'A Painless Step by Step Approach in Getting Evidence into Clinical Practice', was given by Dr Emily Ang. This workshop also incorporated presentations of research works by the following JurongHealth nurses: SSN Liang Qing, Urology Clinic; NC Maha Letchumi, Training and Development; APN Clarice Wee, Intensive Care Unit; and ANC Siti Zainah, Training and Development.

Research and Quality Symposium at a Glance

Time	Programme
0800–0900	**Registration and Breakfast** (All to be seated by 0845)
0900–0915	**Opening Address** A/Prof Cheah Wei Keat Chairman, Medical Board Ng Teng Fong General Hospital
0915–1015	**Keynote Speech: Innovations in Population Health** A/Prof Josip Car Director, Health Services Outcomes Research Programme Director, Centre for Population Health Sciences Lee Kong Chian School of Medicine, Nanyang Technological University
1015–1030	**Q&A**
1030–1115	**Keynote Speech: Clinical Research for Busy Clinicians** A/Prof Teoh Yee Leong Chief Executive Officer Singapore Clinical Research Institute
1115–1130	**Q&A**
1130–1300	Lunch (Poster Exhibition)
1300–1500	Oral Presentation
1500–1530	Tea Break (Poster Exhibition)
1530–1550	Presentation of Prizes and Tokens of Appreciation
1550–1600	**Closing Address** Ms Chee Thong Gan Group Director, Allied Health Ng Teng Fong General Hospital

Winners of Oral and Poster Competitions

Oral Presentation Category

First Prize
Standardisation in the preparation of essential tracheostomy equipment for tracheostomy emergencies: a quality improvement project
Nadaisan Rajoo ML, Yong OL, Raman Pillai S, Teo HS, Leano GC, Kasinathan RD
Presenter: Maha Letchumi Nadaisan Rajoo

Second Prize
A single inpatient rehabilitation class with standard acute ward physiotherapy care improves the functional independence of patients who have undergone total knee replacement and promotes early discharge
Vijaya Ratnam A, Chua WJS, Zainuldin R
Presenter: Chua Wen Jing Sheryl

Third Prize
JurongHealth PURE DECO (Pharmacy home medication reviews: Unresolved and REsolved Drug related problems and their Effects on Clinical Outcomes)
Wee ZY, Tan WK, Soh CK
Presenter: Soh Cheow Khoon Alex

Poster Competition Category

First Prize
Mobile virtual training platform improves productivity and delivery of nursing education
Balan P, Mohamed RSZ, Lau ME, Ng GMB

Second Prize
Evaluation of the Chronic Disease Self-Management Programme in Singapore
Fan XY, Shivajirao HN, Yang KS, Liao WF

Third Prize
A new joint nurse-physiotherapist clinic reduced lead-time and improved phase II cardiac rehabilitation
Toh LC, Zainuldin R, Lim KC

Schedule for Oral Presentation

Title	Presenter
A single inpatient rehabilitation class with standard acute ward physiotherapy care improves the functional independence of patients who have undergone total knee replacement and promotes early discharge	Chua Wen Jing Sheryl, Physiotherapy–Rehabilitation, NTFGH
Adrenal gland imaging in the era of 3D reading and advanced imaging tools	Tan Min On, Radiology, NTFGH
Comparison of international normalised ratios attained by a point-of-care device and those attained using laboratory-based venipuncture in a pharmacist-managed anticoagulation clinic	Cheow Wan Qing Solana Bernita, Pharmacy, NTFGH
Factors affecting the user acceptance of a hospital-wide, fully computerised nursing documentation system	Loo Gaik Lee, Nursing–Training and Development, NTFGH
JurongHealth PURE DECO (Pharmacy home medication reviews: Unresolved and REsolved Drug related problems and their Effects on Clinical Outcomes)	Soh Cheow Khoon Alex, Pharmacy, NTFGH
Screw versus tightrope fixation for syndesmosis repairs: a systematic review and meta-analysis	Chen Xi, Orthopaedic Surgery, NTFGH
Standardisation in the preparation of essential tracheostomy equipment for tracheostomy emergencies: a quality improvement project	Maha Letchumi Nadaisan Rajoo, Nursing–Training and Development, NTFGH
There is a strong correlation between gastrocnemius tightness and pain in plantar fasciitis	Christopher J Pearce, Orthopaedics, NTFGH
The impact of an electronic closed-loop medication system on medication administration errors: a retrospective-prospective comparative study conducted in Singapore	Shiji Kuttan, Nursing, NTFGH
Volume-based 3D computed tomography imaging of the breast: a new paradigm in breast imaging?	James Yang Zheng, Radiology, NTFGH

CATEGORY: CLINICAL RESEARCH

A single inpatient rehabilitation class with standard acute ward physiotherapy care improves the functional independence of patients who have undergone total knee replacement and promotes early discharge

Vijaya Ratnam A[1], Chua WJS[1], Zainuldin R[1]
[1]Physiotherapy, Ng Teng Fong General Hospital, Singapore

INTRODUCTION Preliminary findings showed that even with early physiotherapy, 53% of our patients were transferred to subacute care settings for extended rehabilitation after total knee replacement (TKR). We thus evaluated the effects of supplementing usual physiotherapy with a single-session inpatient TKR class on functional outcomes and discharge potential.

METHODS Based on day of operation, patients with unilateral TKR were conveniently allocated into the TKR class plus usual physiotherapy (CG) group or the usual physiotherapy (UG) group. The Risk Assessment and Prediction Tool (RAPT) was used preoperatively. Knee range of motion and functional performance were scored using the Modified Iowa Level of Assistance Scale (MILAS) on postoperative Day (POD) 1 and at discharge from acute hospitalisation. The TKR class was conducted between PODs 2 and 3.

RESULTS The CG group had 17 patients, while the UG group had 38. The mean length of stay (LOS) was 5.0 ± 1.8 days. The CG group showed four points greater improvement in MILAS than the UG group (95% CI –7.6 to –0.55; $p = 0.037$). More patients in the CG group than in the UG group were discharged home (82% vs. 66%). Potential for home discharge correlated with RAPT score, age, LOS and MILAS at discharge ($MILAS_{post}$). $MILAS_{post}$ was the strongest predictor ($MILAS_{post} \leq 9$ could reasonably predict home discharge).

CONCLUSION A single TKR class plus usual physiotherapy resulted in better functional outcomes and $MILAS_{post}$ best predicted home discharge. These findings suggest that decisions on the discharge destinations of patients should be made after attendance of a TKR class during acute care.

CATEGORY: CLINICAL RESEARCH

Adrenal gland imaging in the era of 3D reading and advanced imaging tools

Tan MO[1], Teh HS[1], Goh L[1]
[1]Radiology, Ng Teng Fong General Hospital, Singapore

INTRODUCTION This study aimed to review the morphology of the adrenal gland using 3D reading and other advanced imaging tools.

METHODS This was a retrospective, single-institution study. We conducted a computerised search of a radiology information system over a two-week period and obtained a list of cases where computed tomography (CT) scans of the abdomen, urinary tract, kidneys, ureters and bladder were taken. We excluded cases that had degraded image quality, movement artefact, paucity of adjacent fat (as this would cause suboptimal assessment of the gland) and significant pathology resulting in distortion of normal anatomy. The presence, location, size and shape of the adrenal glands were evaluated using 3D reading and advanced imaging tools.

RESULTS A total of 172 patients were evaluated. Both the right and left glands sit on the anterior perirenal fascia, outside the perirenal space. They are separated from the upper third of the kidneys by perirenal fat. They consist of three 'fins' – one superior and two inferior (medial and lateral). The three fins are fused at the body of the gland, giving an appearance of 'nodularity' on conventional 2D picture archiving and communication systems in some patients. The lateral fin of the right gland has a convex crescentic shape and is closely related to the inferior medial surface of the adjacent liver, while the lateral fin of the left gland slopes gently forward, giving a concave appearance within the relative abundance of surrounding fat tissue.

CONCLUSION Advancements in imaging technology enables better appreciation of adrenal gland morphology, potentially impacting clinical care.

CATEGORY: CLINICAL RESEARCH

Comparison of international normalised ratios attained by a point-of-care device and those attained using laboratory-based venipuncture in a pharmacist-managed anticoagulation clinic

Cheow WQSB[1], Liu MS[1], Chua CWD[1], Saw LY[1]
[1]*Pharmacy, Ng Teng Fong General Hospital, Singapore*

INTRODUCTION Many different point-of-care (POC) devices have been shown to safely and effectively measure the international normalised ratio (INR) of individuals who require warfarin. POC devices are a more convenient way of measuring a patient's INR as compared to laboratory analysis. However, the reliability of such devices has yet to be assessed in the anticoagulation clinics of JurongHealth Services (JHS). This study aimed to evaluate the accuracy of CoaguChek XS®, a POC device, to identify its maximum cut-off INR for accurate clinical adjustment of warfarin dosing, in JHS anticoagulation clinics.

METHODS A total of 60 patients (median age 77.5 years) who were receiving warfarin were enrolled. Blood samples were taken by certified healthcare professionals. The INR of each patient was obtained using both CoaguChek XS and laboratory analysis. The compiled INR measurements were compared using regression analysis, and a Bland-Altman plot was used to analyse the agreement between the INR results obtained via CoaguChek XS and via laboratory analysis. Clinical applicability was measured by discrepant INR values, using a clinical agreement criterion defined in the literature.

RESULTS There was excellent correlation between the INR results obtained via CoaguChek XS and those obtained via laboratory analysis (r = 0.98; p < 0.001). For INRs < 2 and 1.5–2.5, all results were in clinical agreement. For INRs 2.0–3.0 and 2.5–3.5, 96.7% and 82.6% of the results were in clinical agreement, respectively. However, for INRs > 3.0 and > 3.5, only 52.9% and 22.2% were in clinical agreement, respectively.

CONCLUSION This study showed that CoaguChek XS is reliable for the clinical adjustment of warfarin for INR ≤ 3.0 in JHS anticoagulation clinics.

CATEGORY: CLINICAL RESEARCH

Screw versus tightrope fixation for syndesmosis repairs: a systematic review and meta-analysis

Chen X[1], Chen Y[2], Li R[1], Pearce C[1,2]
[1]*Orthopaedic Surgery, Ng Teng Fong General Hospital, [2]Orthopaedic Surgery, National University Hospital, Singapore*

INTRODUCTION We conducted a systematic review and meta-analysis to compare the clinical outcomes of screw (static) and tightrope (dynamic) fixation for syndesmosis repairs.

METHODS A comprehensive search for English-language articles that compared the clinical outcomes of the two techniques was performed on PubMed, Scopus, Web of Science and the Cochrane register. Case-control studies, cohort studies and randomised control trials that directly compared the outcome of screw fixation and tightrope techniques in clinical settings were included in our analysis. Non-clinical studies (e.g. purely anatomic, biomechanical or radiological studies) and *in vitro* studies were excluded; studies that had unclear follow-up durations, insufficient case samples, revision surgeries, and Levels III and IV evidence were also excluded.

RESULTS The study population consisted of 649 patients who underwent ankle syndesmosis repair. Of these 649 patients, 384 (59.2%) had tightrope fixation and 265 (40.8%) had screw fixation. The average follow-up duration was 19.1 ± 8.6 months. Tightrope fixation yielded superior postoperative outcomes; the patients had a lower complication rate (n = 24, OR 0.242, 95% CI 0.114–0.514) and a lower chance of needing implant removal surgery (n = 16, OR 0.047, 95% CI 0.024–0.091). In terms of postoperative functional status, there was no statistically significant difference between the two types of fixation. However, some studies suggested that patients who underwent tightrope fixation had quicker return to work and shorter follow-up durations.

CONCLUSION Tightrope fixation for ankle syndesmosis repair showed superior surgeon-recorded stability according to the postoperative implant removal rates, incidence of surgical complications and ankle function scores.

CATEGORY: CLINICAL RESEARCH

There is a strong correlation between gastrocnemius tightness and pain in plantar fasciitis

Pearce CJ[1], Cheng LK[1], Lau B[1]
[1]Orthopaedics, Ng Teng Fong General Hospital, Singapore

INTRODUCTION Plantar fasciitis is the commonest cause of heel pain. This is the first study quantifying the degree of tightness in the gastrocnemius in relation to the severity of symptoms in plantar fasciitis. **METHOD** 47 consecutive patients with plantar fasciitis completed the visual analogue scale (VAS) for heel pain on first standing in the morning and the worst pain they had that week. Ankle dorsiflexion was measured with a goniometer with the knee straight and then bent (Silfverskiold's test). All patients underwent a gastrocnemius-stretching regime. They were assessed at presentation, six weeks, three months and six months, or until their symptoms had resolved. Pearson's correlation coefficient was calculated to analyse the relationship between the difference (in degrees) in ankle dorsiflexion with the knee bent and straight (representing gastrocnemius tightness), and the VAS scores.

RESULTS There were 106 data points. There was a strong correlation (r = 0.76) between gastrocnemius tightness and VAS pain on first standing in the morning (p ≥ 0.001) and (r = 0.74) for the worst heel pain the patient had experienced that week (p ≥ 0.001). Mean gastrocnemius tightness was 22° at initial presentation compared to 12° at final follow-up (p < 0.001). The mean pain score in the morning at presentation was 6.6 compared to 2.6 at final follow-up (p < 0.001). Similarly, the mean scores for worst pain were 7.6 and 3.2, respectively (p < 0.001).

CONCLUSION This study demonstrates a strong correlation between the degree of gastrocnemius tightness and the severity of pain in plantar fasciitis. Gastrocnemius stretching is an effective treatment for plantar fasciitis.

CATEGORY: CLINICAL RESEARCH

Volume-based 3D computed tomography imaging of the breast: a new paradigm in breast imaging?

Yang J[1], Teh HS[1], Tan ML[1], Quah R[1], Chee D[1], Goh L[1]
[1]Radiology, Ng Teng Fong General Hospital, Singapore

INTRODUCTION This study aimed to retrospectively evaluate the diagnostic performance of volume-based 3D computed tomography (CT) imaging in the detection of breast lesions.

METHODS A retrospective database search was performed in a single institution. A total of 22 women who had a breast biopsy and CT of the thorax were identified. The mean age of the women was 58.2 (range 24–77) years. The CT scans were compared with the mammogram and/or ultrasound results for their utility in detecting breast lesions. Patients were excluded if they had surgery or a biopsy performed in the interval between the CT scan and the other imaging modality.

RESULTS Only 18 of the 22 women were included in the analysis. A total of 24 lesions were identified (21 masses, 3 clustered microcalcifications). Using the CT scans, we were able to identify 19 (90.5%) of the 21 masses, and 2 (66.7%) of the 3 clustered microcalcifications. Features predictive of malignancy were irregular margins, peripheral rim enhancement and tumour neovascularity.

CONCLUSION The use of volume-based 3D CT imaging may be advantageous in the evaluation of breast cancer, as it may help overcome the limitations of conventional mammography that are caused by overlapping breast tissue. It may also be a useful adjunct investigation tool in the staging of breast cancers.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

Factors affecting the user acceptance of a hospital-wide, fully computerised nursing documentation system

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[1]Nursing Training and Development, Ng Teng Fong General Hospital, Singapore

INTRODUCTION This study aimed to identify whether factors, such as gender, age, highest professional educational background, designation and nationality, affect user acceptance of a hospital-wide, fully computerised nursing documentation system and to analyse the correlation among the different factors.

METHODS This prospective intervention study was conducted between March 2015 and March 2016. Data was collected at three time points: (a) approximately three months before the introduction of the electronic medical records (EMR) system, (b) approximately three months after introduction of EMR, and (c) approximately nine months after introduction of the hospital-wide, fully computerised nursing documentation system. A validated questionnaire that consisted of four sections (demographic data, Computer Anxiety Rating Scale, Internet Attitude Scale and Computer Self-Efficacy Scale) was used to identify the factors that affected user acceptance.

RESULTS We found that the nurses had a realistic and generally positive attitude toward the change to a hospital-wide, fully computerised nursing documentation system. In general, the results suggested that the nurses had moderate computer anxiousness, medium attitudes toward the Internet and high computer self-efficacy. The quantitative results showed that two factors, computer anxiety rating and computer self-efficacy score, influenced the acceptance of the hospital-wide fully computerised nursing documentation system; nurses who had moderate computer anxiousness and high computer self-efficacy were more likely to accept the change.

CONCLUSION The results of the study demonstrated the importance of computer experience in the acceptance of a hospital-wide, fully computerised nursing documentation system among nurses.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

JurongHealth PURE DECO (Pharmacy home medication reviews: Unresolved and REsolved Drug-related problems and their Effects on Clinical Outcomes)

Wee ZY[1], Tan WK[1], Soh CK[1]
[1]Department of Pharmacy, Ng Teng Fong General Hospital, Singapore

INTRODUCTION Pharmacist-led home medication reviews (HMRs) have been implemented in various countries, including Singapore, to facilitate the transition of care from hospital to community. This study aimed to evaluate the effectiveness of HMRs in Singapore, in the areas of drug-related problems (DRP), clinical outcomes and hospital-readmissions.

METHODS This was a retrospective, longitudinal cohort study. Patient records were evaluated between March 2013 and September 2015. Patients recruited into the JurongHealth Pharmacist Outreach Programme (POP) were included in the study, except those who passed away during the study, got transferred to other healthcare institutions, and/or had no DRPs identified during the home visits. Pharmacists in the programme worked in collaboration with care coordinators. The primary outcomes of the study included the total number of DRPs, types of DRPs, number of resolved and unresolved DRPs (according to DRP type) and their potential clinical outcome (i.e. neutral, morbidity or mortality). The secondary outcomes were hospitalisation rate and LOS, six months prior and after referral to POP.

RESULTS 1,226 DRPs were identified in 205 patient cases (average of 5.98 DRPs/case). The most common DRP identified was non-adherence (50.5%). 76.9% of all DRPs were resolved; non-adherence appeared to have the lowest resolution rate. 58.7% of the total DRPs were associated with worse morbidity outcome, while 29.4% were associated with increased mortality. Unplanned rehospitalisation rate and LOS were significantly reduced within one, three and six months of the programme.

CONCLUSION Pharmacist-led HMR can potentially improve the clinical outcome of patients, and reduce unplanned hospital readmission rate and LOS.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

Standardisation in the preparation of essential tracheostomy equipment for tracheostomy emergencies: a quality improvement project

Nadaisan Rajoo ML[1], Yong OL[1], Raman Pillai S[1], Teo HS[2], Leano GC[2], Kasinathan RD[2]

[1]Nursing Training and Development, [2]Nursing Ward B12, Ng Teng Fong General Hospital, Singapore

INTRODUCTION Nurses play a vital role in providing effective tracheostomy care. Caring for a patient with a tracheostomy involves a multidisciplinary team. To ensure optimal care and patient safety, staff caring for tracheostomy patients need to have adequate skills and experience. As part of the strategy to manage tracheostomy emergencies and complications, nurses in wards were required to ensure that essential tracheostomy equipment were readily available at the patient's bedside. This study aimed to evaluate the effectiveness of this initiative.

METHODS A nursing team was formed to carry out the project. The project utilised the Plan-Do-Check-Action (PDCA) methodology to facilitate a process of change; an audit, feedback and re-audit cycle was used as a strategy to improve clinical practice. The team conducted the project in three phases over a three-month period (April–July 2016).

RESULTS At the end of the project, the audit showed 100% compliance for two criteria: preparation of essential tracheostomy equipment at the patient's bedside; and correctly prepared essential tracheostomy equipment (check done by a nurse). There was a 92% compliance for the criteria: nurse had the knowledge to use the essential tracheostomy equipment in the event of a tracheostomy emergency. Nurses' feedback showed that they felt more competent in the preparation of the essential tracheostomy equipment after the quality improvement project.

CONCLUSION This project demonstrated the feasibility of conducting a quality improvement project using the PDCA methodology in a clinical setting. The commitment and enthusiasm of the parties involved were crucial to ensure the success and sustainability of the project.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

The impact of an electronic closed-loop medication system on medication administration errors: a retrospective-prospective comparative study conducted in Singapore

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INTRODUCTION According to a report published by the Ministry of Health, Singapore, there are no published local statistics on medication error rate. However, the report stated that most medication errors were the result of workflows or situations that led people to make mistakes or fail to prevent mistakes. The implementation of an electronic medical records system, a barcode verification system and an automated dispensing cabinet were part of an initiative to prevent medical errors. The present study aimed to examine the impact of an electronic closed-loop medication system (ECLMS) on medication administration errors.

METHODS This study was a retrospective and prospective comparative study. Data on reported medication administration errors was obtained from our hospital's incident reporting information system, while data on unreported medication administration errors was gathered through direct observation of the medication administration process.

RESULTS After the implementation of ECLMS, there was a marginal decrease in the number of medication administration errors per 1,000 patient days. This decrease was not statistically significant (95% CI –0.44 to 0.064; p = 0.14). In our one-year study, the difference in the total six-month incidence rate and the ratio of the total six-month incidence rate showed that the rate of medication administration errors were not significantly different before and after the implementation of ECLMS.

CONCLUSION The slight reduction in the total number of medication administration errors at six months after the implementation of ECLMS, although not statistically significant, is clinically significant. More studies are needed to establish whether ECLMS is effective in reducing the rate of medication administration errors.

CATEGORY: CLINICAL RESEARCH

A database for the identification of *Burkholderia pseudomallei* using Matrix-assisted Laser Desorption/Ionisation Time of Flight Mass Spectrometry (MALDI-TOF MS)

Ang HZ[1], Ong CH[1], Mahobia N[1], Lam CWL[1]
[1]Laboratory Medicine, Ng Teng Fong General Hospital, Singapore

INTRODUCTION *Burkholderia pseudomallei* (*B. pseudomallei*) causes meliodosis, which is endemic in Southeast Asia. The disease is acquired through the environment by inhalation or inoculation through broken skin barriers. While the use of MALDI-TOF MS for identification has hastened culture reporting, it is limited by the number of strains in the database. *B. pseudomallei* is classified in the Biological and Toxins Act as a first schedule agent and is not included in the basic identification database. Conventional identification methods for *B. pseudomallei* would require > 48 hours. To improve turnaround time (TAT), a customised MALDI-TOF MS identification database for *B. pseudomallei* was built. This study aimed to evaluate the ability of the custom database to improve TAT.

METHODS Protein extraction was performed on clinical strains of *B. pseudomallei* (n = 7) to obtain data for the custom database. Routinely suspected *B. pseudomallei* isolates were analysed using the custom database. TAT from preliminary result or growth to the reporting of the identification of *B. pseudomallei* was monitored.

RESULTS From December 2015–July 2016, 15 isolates were accurately identified using the custom database with a score > 2 (identification reliable up to species level). Results from a parallel confirmation test, using a conventional kit (Microbact12AB), tallied with the MALDI-TOF MS identification results. All of the identification results were reported within 6–24 hours.

CONCLUSION Inclusion of *B. pseudomallei* strains into the MALDI-TOF MS database improved TAT for culture reporting, from > 48 hours to 6–24 hours. Early identification leads to better clinical outcomes.

CATEGORY: CLINICAL RESEARCH

Association between preoperative nutritional status and the clinical outcomes of amputees after surgery: a systematic review

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[1]Dietetics and Nutrition, Ng Teng Fong General Hospital, Singapore, [2]Discipline of Nutrition and Dietetics, Flinders University, Australia

INTRODUCTION This review aims to determine whether there is an association between preoperative nutritional status and the clinical outcomes of amputees after surgery.

METHODS Two reviews will be independently conducted. Cochrane's CENTRAL, PubMed, CINAHL and Scopus will be searched for relevant papers. Since nutrition screening and assessment tools are often used interchangeably, synonyms of malnutrition and nutritional status will be combined with synonyms of screening and assessment to identify all types of nutrition screening and assessment tools. Results from this search will then be combined with amput* to identify potential articles. In both reviews, the reviewer will independently screen the titles and abstracts, and exclude studies that are clearly not aligned with the aims of the review. The full-text versions of all poten-tially relevant studies will be obtained for further evaluation. Articles written in English, with adult subjects who have undergone limb or foot amputation, will be included regardless of study design. Studies with nutritional assessment conducted before or within 48 hours of amputation will be included to minimise reverse causality bias. On the other hand, studies conducted on populations that were pregnant or had undefined nutritional status at baseline will be excluded. To assess the risk of bias among the eligible studies, both reviewers will independently use the JAMA Prognosis Critical Appraisal Checklist. Pertinent data will be extracted independently, into a standardised spreadsheet. Disagreements will be resolved by discussion. If no consensus can be reached, a third reviewer's opinion will be sought. This review will be completed in December 2016.

Evaluation of the Cepheid® Xpert Hepatitis C Viral Load assay for the rapid detection and quantification of hepatitis C virus RNA in human serum

Bai XL[1], Mahobia N[1], Lam CW[1]
[1]Laboratory Medicine, Ng Teng Fong General Hospital, Singapore

INTRODUCTION This study aimed to evaluate the performance of the Cepheid® Xpert HCV Viral Load assay for the rapid detection and quantification of HCV RNA in human serum or plasma specimens infected with HCV.
METHODS Blood specimens were collected from January–May 2016 and sera were separated. The Xpert HCV Viral Load assay was performed on stock and fresh serum specimens using the GeneXpert Dx analyser. The results were compared with the results obtained using the Roche HCV Viral Load assay (performed in another general hospital).
RESULTS There was a 95% correlation between the results of the two assays. Linear regression analysis demonstrated a linear range of HCV RNA quantification from 15–1.81×10^6 IU/mL (1.18–6.26 log, R^2 value 0.9985). The total assay precisions ranged from 3.12%–8.07%. Reference interval verification showed 100% negative results in the serum specimens obtained from 20 healthy individuals. The detection limit of 10 IU/mL was verified with diluted specimens. A small percentage of invalid results were generated and these were resolved by repeat testing with specimen dilutions.
CONCLUSION The Xpert HCV Viral Load assay allowed accurate detection and quantification of HCV RNA from serum or plasma specimens in a turnaround time (TAT) of 2 hours with random access. Traditional PCR is usually performed 1–2 times a week and in batches, resulting in delayed TAT. A shorter TAT enables rapid diagnosis and treatment of patients infected with HCV. In addition, the Xpert HCV Viral Load assay needs minimal hands-on time, thus reducing manpower needs and saving costs.

Evaluation of the use of Abbott Architect C8000 for measuring glycosylated haemoglobin

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INTRODUCTION This study aimed to evaluate the analytical performance of the Abbott Architect C8000 Chemistry System in measuring glycosylated haemoglobin (HbA1c). Abbott's HbA1c assay is a fully automated and high-throughput enzymatic assay. We also compared its performance with that of Roche Cobas, which uses a different enzymatic HbA1c method.
METHODS The analytical performance of Abbott's HbA1c assay was verified for imprecision, linearity and accuracy. Evaluation for imprecision was done by measuring two levels of quality control material (Bio-Rad Diabetes Control) in triplicate over five days in accordance to the EP5-A2 guidelines of the Clinical and Laboratory Standards Institute. Linearity and accuracy were analysed in triplicate for five linearity material specimens, which ranged from 4.0% to 15.0% HbA1c.
RESULTS Within-laboratory imprecision was satisfactory (coefficient variation [CV] < 1.1% for 5.4% HbA1c and < 1.5% for 10.0% HbA1c). According to NGSP, the HbA1c assay is designed to have a within-laboratory imprecision CV < 2.0% for samples up to 6.5% HbA1c and a within-laboratory imprecision CV ≤ 3.5% for samples above 7.0% HbA1c. Abbott's HbA1c assay was linear across the manufacturer's claimed measuring range (4.0%–15.0%), with a 1.002 slope and a –0.11 intercept. The HbA1c assay passed the accuracy test; the maximum deviation for a mean recovery from 100% was 3.1%. For the assay comparisons, samples from 79 women and 89 men were used (age range 17–99 years, mean age 57.8 ± 19.0 years). Passing-Bablok Regression was 1.025641 for Abbott and –0.235897 for Roche. There was no significant deviation from linearity (Cusum test used, p = 0.06; r = 0.99, 95% CI 0.9865–0.9926). Bland-Altman plots revealed a mean absolute difference (Abbott-Roche) in HbA1c values of 0.01% (range –0.75 to 0.77). For HbA1c samples below 6.5% (n = 100), the mean difference was 0.08% (range –0.33 to 0.16) and for HbA1c samples over 6.5% (n = 68), the mean difference was 0.16% (range –0.95 to 1.26).
CONCLUSION The imprecision of Abbott's HbA1c assay was well within NGSP targets. There was close agreement between the HbA1c assays of the Abbott and Roche systems. Abbott's HbA1c assay is a viable alternative for HbA1c measurement in clinical laboratories.

Evaluation of the BD EpiCenter™ blood volume monitoring system

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INTRODUCTION Blood culture is a critical tool for healthcare professionals as it is a means of detecting the presence of bacteria or fungi in the bloodstream. However, false positives and false negatives, due to the volume of blood inoculated, have always limited the utility of this tool. Traditionally, the process of monitoring the filling degree of blood culture bottles was done by manual pre- and post-inoculum weighing, which is a very tedious process. As technology advances, the use of computer-based tools to calculate the volume of blood inoculated has increased. The EpiCenter™ system by Becton, Dickinson and Company (BD) is one such tool. This study aimed to evaluate the use of the BD EpiCenter system for blood volume monitoring (BVM).

METHODS The graphs generated by the BD EpiCenter system was compared with the graphs plotted through manual pre- and post-inoculum weighing of aerobic BACTEC bottles, over a period of three months.

RESULTS During the duration of the study, 2,432 bottles were monitored by the BD EpiCenter system, while 2,237 bottles were manually weighed. BD EpiCenter system calculated the volume of negative aerobic bottles with a mean underestimation of 0.1 mL as compared to the weight-based volumes.

CONCLUSION The BD EpiCenter BVM system can be used to replace the current method of manual weighing as the deviation falls within the set limit of no more than 1.1 mL variation from manually collected data. The BD EpiCenter BVM data collected would be shared with Ng Teng Fong General Hospital's clinicians on a biyearly basis.

Evaluation of the detection of *Treponema pallidum*, the bacterium that causes syphilis, using Abbott Architect I-2000

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INTRODUCTION Serological testing is the most frequently used approach in the laboratory diagnosis of syphilis. Architect Syphilis TP by Abbott is a chemiluminescence immunoassay that is considered to be a good screening test due to its high sensitivity and full automation. This study aimed to verify the analytical performance of Architect Syphilis TP on Abbott Architect I-2000 for the detection of antibodies to *Treponema pallidum* in human serum.

METHODS The analytical performance of the instrument was verified for imprecision, carryover, analytical sensitivity and specificity. To measure imprecision, the test was performed in triplicate with positive and negative control samples, and two levels of pooled sera for five days in accordance to the CLSI EP5-A2 guidelines. Carryover study was conducted. The sensitivity and specificity of Architect Syphilis TP were compared with those of the old and newly revised Bio-Rad enzyme immunoassay (EIA) kits.

RESULTS The within-laboratory imprecision showed good performance, with a coefficient variation of < 20% for the negative control and < 10% for the positive control. The results of the high-low sequence were statistically identical to the results of the low-low sequence; the error was lower than the acceptable error limit. The sensitivity and specificity were 95.2% and 100%, respectively, and this was comparable to the performance of the Bio-Rad EIA kits.

CONCLUSION Our study showed that Abbott's Architect Syphilis TP has satisfactory analytical performance. As the assay is fully automated and easy to use, it would be a suitable choice for high-volume laboratories.

CATEGORY: CLINICAL RESEARCH

Improvement in the sensitivity and processing efficiency of water sterility testing after a change in methodology

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INTRODUCTION Water sterility testing is routinely performed in healthcare environments to ensure that the water used in clinical processes is safe for patients. A more sensitive and efficient testing procedure was introduced in our hospital to improve the quality and reliability of water sterility testing. This study evaluated the effectiveness of the new method.

METHODS Three water samples with 1.5×10^1–1.5×10^3 CFU/mL of *Staphylococcus aureus* were obtained using a 1:10 dilution method. Each sample was processed using both the old and new methods for comparison against controls. In the old method, 1 mL of the sample was mixed with liquefied nutrient agar and poured out to set before incubation. In the new method, 100 mL of the sample was passed through a cellulose membrane filter using an electric pump. Organisms present were retained on the membrane, which was incubated on nutritive agar. After 48 hours, the plates were observed for colony growth and count.

RESULTS Colony count (CFU) obtained using the new method fell within the expected range of the respective concentrations (i.e. all or majority of the bacteria present were retained and detected). With the old method, no bacterium was detected for the lowest tested concentration; for the other two concentrations, the CFUs were both less than 4% of the expected. With the new method, processing time was reduced from 30 minutes to 1 minute per sample.

CONCLUSION The new method was more sensitive and efficient; the processing time was reduced and the sensitivity increased by 100-fold.

CATEGORY: CLINICAL RESEARCH

Nutritional supplementation for patients on haemodialysis: the development of a high-protein snack food and its comparison with a standard renal-specific liquid supplement

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INTRODUCTION In this study, we developed a high-protein snack food (HPSF), which has a similar nutritional composition as the current renal-specific oral nutritional supplement (RS-ONS) but less fluids, for patients on haemodialysis (HD). The acceptability of the HPSF, as compared to RS-ONS, was evaluated.

METHODS We enrolled 45 patients on HD, but only 36 (23 male, 13 female) completed the study. A seven-point hedonic scale was used to quantify the acceptability of RS-ONS. Patient preference for an alternate supplement, in the form of a HPSF, was collated and ranked. The preferred HPSF with the least fluid was developed and its acceptability tested.

RESULTS Although the nutrition composition per serve of HPSF and RS-ONS were comparable in terms of calories (158 kcal and 155 kcal, respectively), HPSF was higher in protein (10.9 g vs. 7.2 g), lower in potassium (35.4 mg vs. 75 mg) and phosphate (23.4 mg vs. 65 mg), and void of free fluids. The sweetness, saltiness, aroma and flavour of HPSF were preferred (p < 0.05). Compared to HPSF, more patients (72%) wanted improvements in RS-ONS and a lower frequency of RS-ONS consumption (p = 0.01). The cost of HPSF was estimated to be a third of the cost of RS-ONS ($0.55 vs. $1.65).

CONCLUSION HPSF was preferred over RS-ONS and was likely to be consumed more frequently. Its cost-effectiveness and nutrient profile make it a desirable alternative to RS-ONS. Larger observational studies are needed to examine patient adherence to HPSF and whether HPSF can improve nutritional markers in the long term.

CATEGORY: CLINICAL RESEARCH

The use of a double-button adjustable-loop device is biomechanically equivalent to the use of a tension band wire in the fixation of transverse patellar fractures: a cadaveric study

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INTRODUCTION Tension band wire (TBW) fixation of patellar fractures is associated with significant hardware-related complications and infection. The use of a double-button adjustable-loop device, that is, the TightRope® four-point locking system using FibreWire, offers stiff, rigid fixation and obviates the need for implant removal. This study compares the rigidity of patellar fractures treated with TightRope fixation and those treated with conventional TBW fixation, in a cadaveric model.

METHODS TBW fixation was compared to TightRope fixation of transverse patella fractures in five matched pairs of cadaveric knees. The knees were cyclically brought through a 0°–90° motion, for 500 cycles. Fracture gapping was measured using an extensometer before the start of the cycles, and at the 50th, 100th, 200th and 500th cycle. The mean maximum fracture gap was calculated.

RESULTS All but one cadaver from each group survived the 500 cycles. The two failures were due to a fracture gap of more than 3 mm during cycling. There was no significant difference between the two groups in the mean number of cycles tolerated. There was no implant breakage. The difference in mean maximum fracture gap was not significantly different between the TBW group and the TightRope group, up to 500 cycles (0.3026 ± 0.4091 mm vs. 0.3558 ± 0.7173 mm, $p = 0.388$).

CONCLUSION We found no difference between TBW fixation and TightRope fixation in terms of fracture gapping and failure. As TightRope fixation may have a lower risk of complications as compared to TBW, it is a feasible alternative for managing transverse patella fractures.

CATEGORY: CLINICAL RESEARCH

The use of an alarm sensor for monitoring methanol waste levels

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INTRODUCTION Sysmex XN-9000 is an automated haematological system that produces methanol waste, which is stored in a carboy placed behind the analysers. As the waste is toxic, it is handled by a licensed waste management company. The waste level needs to be monitored manually as there is no liquid level sensor to prevent overflows from happening. The lack of a liquid level sensor, coupled with the busyness of our hospital staff, led to a case of methanol overflow in our hospital. To avoid the recurrence of such a case, a sensor for liquid detection was installed. This study aimed to evaluate the effectiveness of this automated monitoring system.

METHODS A sensor that uses a capacitation detection method to detect liquid level was installed on 21 June 2016. With the sensor in place, an alarm would sound when the carboy is 70% full, preventing methanol overflow. The sensor is able to detect fluid about 10 mm away and it is equipped with a 4-second relay so that the alarm is only sounded when the liquid is stationary. The number of overflow incidents were monitored after the installation of the sensor.

RESULTS The use of the sensor reduced manpower wastage. No incidents of waste overflow occurred after the installation of sensor and to date, there has not been any false alarm of waste overflow.

CONCLUSION The use of the sensor was effective in improving work processes and the safety of the workplace, as it eliminated the need for manual checks and minimised the risk of methanol waste overflow.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

A new joint nurse-physiotherapist clinic reduced lead-time and improved phase II cardiac rehabilitation

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INTRODUCTION Our multidisciplinary clinic (MDC) provided single-day consults prior to phase II cardiac rehabilitation (CR) for patients who had undergone percutaneous coronary interventions. However, the lead-time increased to ten weeks and two allied health services were undersubscribed. This study aimed to evaluate the impact of a quality improvement initiative on lead-time and resource allocation.

METHODS Root cause analysis showed that prolonged lead-time and poor resource allocation were caused by fortnightly frequency of MDC, shortage of cardiologists and varied number of slots among the five MDC members within a single day. Since exercise was identified to have a key role in phase II CR, a once-weekly joint nurse-physiotherapist CR clinic was initiated. A plan-do-check-act tool was developed and continuously used to appraise the new initiative. Lead-time, costs to departments and patients, attendance rate, and uptake of the exercise programme were measured and compared with those of the MDC at six-month periods.

RESULTS Lead-time was reduced to 10 days and the total resources saved amounted to $6,800/month with the new initiative. Patients paid an average of $60 less. The attendance rates at the new joint clinic and the MDC were 74% and 85%, respectively. Exercise uptake at both clinics were similar (~70%). Among the patients who attended the joint clinic, 10% were identified as unsuitable for exercise due to ongoing symptoms post-discharge; their cardiologist consult was moved to an earlier date.

CONCLUSION The initiative improved lead-time and resource allocation, while maintaining the exercise programme uptake rate. A cardiology specialty nurse was essential for symptom assessment and intervention prior to exercise.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

A pharmacy at most clinic floors for patient convenience: ideas behind implementing a decentralised model of pharmacy services while minimising cost increases

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INTRODUCTION In line with the move to a new hospital premise, a decentralised pharmacy service (where pharmacies are located at almost every clinic floor) was introduced to replace the former centralised pharmacy service. This was done to improve patient convenience. The challenge was to do so with minimal increase in manpower and inventory.

METHODS A centralised drug storage and picking system was chosen to prevent a massive increase in inventory over five locations. Medicines would be packed at the main pharmacy and delivered to satellite pharmacies via a pneumatic tube system. To prevent duplication, manpower allocation at each pharmacy was guided by projected clinic workload. The use of technology, such as live video streaming of each satellite pharmacy, enabled dynamic manpower deployment to areas of need as they arose. Pharmacy process flows were standardised across all locations, to enable seamless cross-coverage of staff.

RESULTS There was minimal duplication of inventory. Centralised pharmacy storage allowed a 45% reduction in potential inventory holding costs. Each satellite pharmacy held no more than 8% of the total inventory costs. Although there was a 55% increase in prescription load due to a higher patient load at the new hospital, this was successfully managed with only a minimal increase in manpower.

CONCLUSION The move from a centralised model of pharmacy service to a decentralised model benefited patients in terms of convenience of access. Financial challenges, such as the need for additional inventory and manpower to sustain a decentralised model, can be partially mitigated through the use of information technology and engineering systems.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

A quantitative study of foot self-care practices among patients with diabetes mellitus in Singapore

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INTRODUCTION Diabetic foot complications and subsequent lower limb amputations commonly occur among diabetic patients due to poor foot care. We aimed to understand the extent of proper foot care practices and to identify the factors that influence these practices among diabetic patients in a multiethnic Asian population.

METHODS A cross-sectional, multicentre, quantitative study was performed. The inclusion criterion was patients attending hospital outpatients clinics for diabetes mellitus. Patients were only excluded if they were unable to understand basic English. Demographic information, medical history (including formal assessment for peripheral neuropathy) and Nottingham Assessment of Functional Footcare (NAFF) scores were collected. All data was analysed using IBM SPSS Statistics version 21.

RESULTS 350 valid responses were obtained. The mean NAFF score was 49.6 ± 7.19. Univariate analysis revealed that the non-Chinese patients had significantly better scores than the Chinese patients. After linear regression analysis, a statistically significant correlation with better foot care practices was found for patients with higher education levels, active employment and the presence of previous diabetic foot complications.

CONCLUSION The mean NAFF scores in our study were lower than those published in other populations; this may in part account for the huge burden of diabetic foot disease in Singapore. Patients appear to start to better look after their feet only after suffering a complication. Cultural and financial factors probably account for the differences in our risk factor findings and those published in other populations. Future studies should evaluate the effectiveness of targeted interventions for the specific groups that we have identified to have poorer NAFF scores.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

A study on the effectiveness of Ng Teng Fong General Hospital's Sub-Acute Ambulatory Care for the Functionally Challenged and Elderly programme in reducing emergency department re-attendances and hospital admissions

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INTRODUCTION Ng Teng Fong General Hospital's Sub-Acute Ambulatory Care for the Functionally Challenged and Elderly (SAFE) programme is a post-emergency department (post-ED) discharge programme that includes comprehensive geriatric assessment and multidisciplinary intervention. This study aimed to evaluate the effectiveness of the programme in reducing ED re-attendances and hospital readmissions.

METHODS This was a 14-month retrospective cohort study. We compared the outcomes of 168 patients who participated in the SAFE programme with the outcomes of 85 patients who were eligible for inclusion in the programme, but declined to participate and thus received usual care. The primary outcomes measured were the difference in the 30-day and 60-day ED re-attendance and hospital readmission after discharge. The risk of 30-day and 60-day ED re-attendance and hospital readmission were measured using a Cox proportional hazards model. The hazard ratios were adjusted for age, gender, Triage Risk Assessment Tool score, and baseline ED and hospital use in the past one year.

RESULTS As compared to the patients who received usual care, the patients who participated in the SAFE programme had a reduced risk of 30-day ED re-attendance and hospital readmission (hazard ratio [HR] 0.43, CI 0.24–0.78; p = 0.005 and HR 0.29, CI 0.15–0.56; p = 0.0002, respectively) and a reduced risk of 60-day hospital readmission (HR 0.47, CI 0.29–0.79, p = 0.004).

CONCLUSION The results of this study suggest that the SAFE programme is effective in reducing the number of ED re-attendances and hospital readmissions among functionally challenged and elderly patients discharged from the ED.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

Assessing the health-promoting environment of residential communities in Western Singapore

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INTRODUCTION This study aimed to assess the health-promoting environment of residential communities in Western Singapore. By better understanding the area's health-promoting environment, constructive feedback can be provided and improvements made to promote healthy living and reduce healthcare burden due to hospitalisations and institutionalised care.

METHODS A locally relevant survey instrument was developed with reference to the validated CDC Worksite Health ScoreCard. The survey was sectioned into categories such as community structure and resources, healthy behaviour, chronic conditions, mental health and common medical emergencies. Specific criteria were used in the score sheet to maintain objectivity. All seven zones in the Yu Hua constituency were scored between November 2014 and June 2016. After the assessment, each zone was provided with a report that included the zone's overall score, a detailed breakdown on the scores of each section and suggestions for improvement over the next year.

RESULTS Yu Hua Zone 4 fared the best, with an overall score of 60%. It was also noted to have the highest participation rate in Health Promotion Board (HPB) initiatives. The overall scores of the other six zones ranged from 31% to 43%. While most zones did well in promoting healthy activity and good mental health, and dealing with common medical emergencies, most did not score well in smoking prevention, weight management and managing chronic medical conditions.

CONCLUSION There was a wide variation in the health-promoting environment of zones within the same constituency. On top of implementing improvements specific to their areas, zone leaders should take advantage of HPB initiatives.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

Assessing the impact of chronic disease screening outcomes on the risk of ten-year coronary artery disease among community health screening participants

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INTRODUCTION This study aimed to assess the impact of chronic disease screening outcomes on the risk of contracting coronary artery disease (CAD) in the next ten years among community health screening participants with no existing chronic conditions (i.e. hypertension, diabetes mellitus and hypercholesterolaemia).

METHODS Community health screening data from 10 October 2015 to 31 March 2016 was used for analysis. Participants aged 40–79 years, of Chinese, Malay or Indian ethnicity, and had no existing chronic conditions were included. The clinical practice guidelines by the Ministry of Health, Singapore, were used for the provisional diagnosis of chronic conditions and the estimation of ten-year CAD risk (intermediate- and high-risk individuals were reclassified as being at-risk). Chi-square test and logistic regression analysis were used to examine the association of ten-year CAD risk with screening outcomes.

RESULTS Among those provisionally diagnosed with chronic conditions, 13% were classified as being at risk of ten-year CAD. In comparison, only 3% of those screened normal were classified as being at risk of ten-year CAD. This difference was statistically significant (OR 4.9, 95% CI 3.1–7.9).

CONCLUSION Individuals who were provisionally diagnosed with new chronic conditions were more likely to contract CAD in the next ten years as compared to those who were not. However, only 13% of those who were provisionally diagnosed with new chronic conditions via screening were at risk of ten-year CAD. In other words, the use of chronic disease screening outcomes to identify individuals at risk of ten-year CAD is limited.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

Audit of documentation proficiency of emergency department patients who were discharged against medical advice before and after the implementation of a checklist

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INTRODUCTION Documentation of patients discharged against medical advice (AMA) is poorly performed in the emergency department (ED). Little is known about the impact a checklist may have on this. Our study aimed to compare the quality of AMA documentation before and after the implementation of a checklist.

METHODS We conducted a retrospective review (pre-checklist implementation), followed by a prospective study (post-checklist implementation), each over three months of AMA interactions in our ED. An 11-point checklist was used to determine the documentation quality during those two periods. Quality was assessed based on the number of points fulfilled on the checklist. Documentation was classified as 'good' (8–11), 'average' (4–7) or 'poor' (0–3). The primary outcome measured was the proportions of discharged AMA records that showed 'good', 'average' and 'poor' documentation. Secondary outcomes were the compliance rates to each of the categories of the checklist before and after its use.

RESULTS We retrieved 339 and 309 complete records from the retrospective and prospective arms, respectively. The proportions of case records in the three grades before and after the use of the checklist were: 'poor' 199/339 (59%) vs. 7/313 (2%); 'fair' 133/339 (39%) vs. 66/313 (21%); and 'good' 7/339 (2%) vs. 240/313 (77%) (all $p < 0.05$). Statistically significant differences in the compliance rates to each of the categories of the checklist before and after implementation were also noted.

CONCLUSION Our study showed that there were improvements in documentation quality and compliance rates after the implementation of an AMA checklist.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

Creating a seamless and hassle-free journey for patients through One Queue, One Bill

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INTRODUCTION The One Queue, One Bill (1Q1B) system facilitates a hassle-free journey for patients on a same-day visit at both Ng Teng Fong General Hospital and Jurong Community Hospital, as patients require only one queue number to access services in the two hospitals. This system, which is integrated with multiple systems, also enables a single consolidated bill at the last touch point.

METHODS A cross-functional team involving staff from several departments was formed to design the 1Q1B system. The team used a process-mapping tool to define a patient's entire outpatient journey, including payment processes at multiple service points, and to identify problem areas. The team also participated in tabletop exercises that were based on simulation, with real clinic scenarios used for validation purposes.

RESULTS The 1Q1B system resulted in improved patient experience. Patients were able to self-register using kiosks located in the hospital lobby or within the clinic premises, get concise information on their forecasted outpatient journey on their queue tickets and opt to receive an SMS reminder when their consultation time is almost due. The system also resulted in streamlined processes, as multiple systems were integrated to enable a single queue number to be transferred seamlessly from one touch point to another. The collection of medications and a consolidated bill at the last touch point was also enabled.

CONCLUSION The 1Q1B system resulted in a smoother and hassle-free experience for patients who have to move from one facility to another, enabling efficient and seamless patient care.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

Cost-effectiveness of the use of an automated patient information board

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INTRODUCTION This study aimed to evaluate whether using an Android tablet as a patient information board (PIB) to display clinical information is a more cost-effective way of disseminating patient care information as compared to conventional manual methods.

METHODS This study analysed the quantitative benefits (in terms of manpower, workload and material savings) of using an Android tablet as a PIB in place of manual methods for a traditional PIB, to calculate the total cost savings of the former method, if any.

RESULTS With the use of an Android tablet PIB, the productivity gained from eliminating the time spent on searching for patients' locations was 1,800 hours/year, which amounts to $23,437.50. The cost of the materials used for a traditional PIB was $10,800.00. The productivity gain for the Android tablet PIB was 5,000 hours/year, and this amounts to $65,104.17. Thus, the implementation of the Android tablet PIB resulted in a total cost savings of $99,341.67. The cost savings came from the reduced use of materials, and the reduced time spent writing and searching for patients' locations.

CONCLUSION The implementation of the Android tablet PIB benefited the hospital as it resulted in more effective communication among the healthcare staff, a reduction in the nurses' manpower hours (as there was a reduced need to manually update the patients' information), and improvement in the staff and patients' satisfaction.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

Cost-saving benefits of intravenous-to-oral antimicrobial conversions in an acute care hospital

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INTRODUCTION The intravenous (IV) route of administration is costly and associated with an increased risk of infusion-related adverse events. Conversion to oral (PO) formulations can reduce costs and the length of hospital stay (LOHS). This study aimed to analyse the cost savings gained by patients who underwent IV-to-PO antimicrobial conversion, as well as to ascertain the clinical outcomes of the same group of patients.

METHODS This prospective study of patients suitable for IV-to-PO antimicrobial conversions was conducted in a 400-bed restructured hospital in Singapore. Data was collected from December 2014–May 2015. Duration and costs associated with hospital stay, and IV and PO drug use were tabulated. Patients were followed up for 30 days after the cessation of IV drug for readmission, reinfection and mortality rates. SPSS was used to analyse the data; *t*-test and Chi-square test were used.

RESULTS A total of 227 out of 358 patients were eligible for conversion; 213 underwent conversions (172 physician-directed, 41 pharmacist-directed). Patients who underwent the conversion had significantly decreased drug costs, LOHS and cost of hospital stay than those who did not (p < 0.001). There was no significant difference in the LOHS and drug costs between pharmacist-directed conversions and physician-directed conversions. There was also no significant difference in the 30-day readmission, reinfection and mortality rates between patients who underwent the conversion and patients who did not.

CONCLUSION IV-to-PO antimicrobial conversion resulted in cost savings for the patient. The clinical outcomes of patients who underwent the conversion did not differ significantly from those who did not.

Comparison of the critical results data of two regional hospitals in Singapore

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INTRODUCTION We reviewed and compared the critical results (CR) data of Alexandra Hospital (AH) and Ng Teng Fong General Hospital (NTFGH). Both hospitals use the same Healthcare Messaging System.

METHODS Data was extracted from the Laboratory Information System over a six-month period (AH: January–June 2015, NTFGH: July–December 2015). Total number of tests ordered, proportion of CR, common analyte reported, median time taken from CR report to clinician acknowledgement and number of delayed notifications (> 60 minutes) were assessed.

RESULTS During the study period, AH ordered 430,719 tests, while NTFGH ordered 683,001 tests. The average proportion of CR to total tests was 0.49% (AH) and 0.61% (NTFGH). The Clinical Chemistry section had the highest number of CR in both hospitals (AH: 61%, NTFGH: 55%). The top five critical results in AH were positive blood culture (14.31%), platelets (13.50%), serum potassium (13.50%), serum glucose (9.11%) and serum sodium (6.87%); in NTFGH, it was positive blood culture (20.90%), platelets (10.90%), serum sodium (10.70%), serum glucose (8.90%) and serum potassium (8.90%). The median time from CR report to clinician acknowledgement was 11 minutes (AH) and 13 minutes (NTFGH). The rate of delayed notifications was 0.67% in AH and 0.96% in NTFGH; delayed notifications were mainly due to escalation to the inappropriate clinician.

CONCLUSION Based on the median time of 5 minutes reported by the College of American Pathologists (CAP), both hospitals have room for improvement. On a positive note, there was no incident of abandoned calls in the two hospitals (CAP reported an incidence of 0.8%–6%).

Development of a diabetes-related nutrition knowledge (DRNK) questionnaire and the identification of sociodemographic factors that are associated with DRNK: a pilot study

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INTRODUCTION This study aimed to evaluate a diabetes-related nutrition knowledge (DRNK) questionnaire that was developed to assess the DRNK of type 2 diabetes mellitus (T2DM) patients and to identify the sociodemographic factors associated with DRNK.

METHODS The first draft of the DRNK questionnaire was created after a literature review of diabetes knowledge questionnaires. The user-friendliness and ambiguity of the first draft was tested (n = 10). The second draft was tested for item difficulty, index of discrimination and internal consistency (n = 30). The third draft was examined for construct validity and test-retest reliability (n = 60). The final questionnaire was administered with the Diabetes Empowerment Scale to T2DM patients (n = 28) to determine the association between DRNK and sociodemographic factors.

RESULTS The questionnaire's item difficulty and index of discrimination ranged from difficult to desirable (13.3–86.7) and poor to very good (–0.5 to 0.75), respectively. It had good overall internal consistency (Cronbach's α 0.838) and construct validity (independent t-test, p < 0.001), and high test-retest reliability (Pearson's r 0.71). The patients had fair DRNK (mean knowledge score 10.9 ± 3.81 out of 22). Generalised linear model showed that DRNK was associated with income and marital status. Compared to the high-income tertile, the middle- and low-income tertiles had lower knowledge scores (p = 0.032 and p = 0.003, respectively). Patients who were not married had higher scores than those who were (p = 0.002).

CONCLUSION The DRNK questionnaire had overall satisfactory psychometric properties. Married and lower-income T2DM patients may benefit from enhanced diet counselling.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

Does collecting payment before dispensing medication impact patient-requested rework rate?

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INTRODUCTION Traditionally, patients make payment after medications have been dispensed to them. Having arrangements that allow patients to pay before dispensing keep patients engaged while waiting for their medications. The quantity of medications that a patient intends to collect are communicated to the pharmacy staff at registration. If a patient requests to amend this quantity when the medication is being dispensed to them, it results in additional work and puts a strain on operations, causing potential delays in the service to subsequent patients. This study aimed to investigate whether the patient-requested rework rate at satellite outpatient pharmacies is lower for patients who made payment before receiving their medication.

METHODS Dispensers at four satellite outpatient pharmacies recorded the number of patient-requested reworks encountered at the point of dispensing and categorised them into two groups – patients who had already made payment and patients who had yet to make payment. The rework rates of these two groups of patients were compared.

RESULTS A total of 232 patient-requested reworks were documented in the month of January 2016. Majority of the patient-requested reworks came from patients who had yet to make payment (88%, 91%, 78% and 76% at the satellite pharmacies at levels 3, 4, 5 and 7, respectively). There was an 8% patient-requested rework rate among the 2,551 patients who received their medications before making payment, and only a 2% patient-requested rework rate among the 1,989 patients who received their medications after they had already made payment.

CONCLUSION Collecting payment from patients before dispensing medication appears to reduce the rate of patient-requested rework at the point of dispensing.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

Evaluation of the Chronic Disease Self-Management Programme in Singapore

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INTRODUCTION Chronic diseases are a major contributor to the disease burden in Singapore. Well-controlled chronic conditions can reduce healthcare costs and improve productivity. Using the existing Chronic Disease Self-Management Programme (CDSMP) model, JurongHealth sought to improve the care of patients with chronic diseases through active involvement of primary care, integrated community services and supporting enablers. This study aimed to evaluate the effectiveness of the CDSMP in improving the health outcomes of a Singaporean population. We hypothesised that CDSMP participants would have improved health status and quality of life at six months and one year post-intervention.

METHODS This was a prospective longitudinal study with follow-up at six months and one year post-intervention. The cohort model was adapted from the Stanford care model conducted in community-based sites. The inclusion criteria were: age > 18 years; ≥ 1 chronic condition; and the ability to physically attend six sessions of CDSMP. CDSMP was held once a week for six consecutive weeks; each session lasted approximately 150 minutes. Health status, healthcare utilisation and perceived self-efficacy were measured.

RESULTS There were 50 participants. Hypertension was the most common chronic condition, followed by diabetes mellitus and hyperlipidaemia. Participants reported improvements in self-rated health ($p = 0.02$) and quality of life mean scores ($p = 0.01$) six months post-intervention. There was also borderline significant improvement in the mean score of positive feeling ($p = 0.02$).

CONCLUSION In our Singaporean population, CDSMP was able to improve mental health and motivation for self-management of health-related risk factors, effectively preventing and/or delaying disease progression.

Exploring perceptions on falls and fall prevention among community-dwelling people with dementia or memory loss and their carers

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INTRODUCTION Although people with dementia are more likely to have poorer outcomes after a fall, we found no reports of a community-based fall prevention programme for this population in the English-language literature. To inform programme development, an exploratory study was conducted in Australia to examine the perceptions of community-dwelling people with dementia or memory loss and their carers regarding falls and fall prevention.

METHODS This study used a cross-sectional survey design. Data was collected through self-administered, web- and paper-based questionnaires. A convenience sample was obtained via advertising with dementia organisations; three valid responses were obtained from persons with dementia or memory loss and 28 from carers.

RESULTS Among the carers, 82.1% indicated a high level of concern about their care-recipients' falls, with many identifying loss of balance as a major cause of falls. The fall prevention strategies undertaken were wide-ranging, with few targeting clear causes. One (33.3%) participant with dementia or memory loss and 14 (50.0%) carers indicated that they were unsure whether falls could be prevented. None of the 31 participants reported that fall prevention was not important. Many carers had difficulty balancing their care-recipients' fall risk against independence. People with dementia or memory loss were commonly perceived as being unable to learn.

CONCLUSION While there were varied views regarding the preventability of falls, fall prevention was largely perceived as important. Falls prevention programmes that encourage healthy ageing, focus on improving balance, and support the learning needs of people with dementia or memory loss may be better received.

Impact of an enhanced environmental cleaning programme in a regional hospital in Singapore

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INTRODUCTION Environmental cleanliness plays a role in the prevention of hospital acquired infections. This study aimed to evaluate the impact of a newly introduced enhanced environmental cleaning (EEC) programme in Alexandra Hospital.

METHODS The study was conducted between May 2013 and August 2014. Fluorescent markers were applied on a standardised selection of 15 high-touch surfaces (HTS) before cleaning. All HTS were inspected using an ultraviolet light to ascertain the thoroughness of cleaning. The original plan was to do a pre-intervention assessment of environmental cleaning, conduct feedback sessions and training after the assessment (i.e. the intervention) and then conduct a single post-intervention assessment. However, disappointing results after the first intervention led to a series of repeated interventions and multiple post-intervention assessments.

RESULTS The results of the first post-intervention assessment showed modest improvement in cleaning. Although there was no statistical difference in cleaning thoroughness for the wards pre-intervention and after the first intervention (p = 0.1051), a difference was noted for the ICU (cleaning improved from 58% to 90%, p = 0.0310). In the operating theatre (OT), there was no significant difference in cleaning thoroughness pre-intervention and after the first intervention (p = 0.0886). Thus, intensive training was conducted for the in-house cleaners and OT staff, and another round of assessment was conducted after the training was completed. The result of the third post-intervention assessment was 85%; compared to pre-intervention, this result was statistically significant (p < 0.005).

CONCLUSION The EEC programme had limited success in our hospital, except in the ICU. Lack of protected time for cleaning, manpower constraints and language barriers (most cleaners were not English-speaking) could have been barriers to success.

Impact of a Chronic Obstructive Pulmonary Disease Integrated Care Pathway programme in JurongHealth

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INTRODUCTION The Chronic Obstructive Pulmonary Disease Integrated Care Pathway (COPD-ICP) programme, which was implemented in JurongHealth in April 2012, aimed to deliver early intervention and integrate care across the care continuum for patients diagnosed with COPD. This study aimed to evaluate the impact of the programme.

METHODS Programme enrollees were classified into four groups based on their symptoms and risk of exacerbations, according to the Global Obstructive Lung Disease guidelines. Care plans were tailored for each group of enrollees. Case managers intervened by linking enrollees to community resources, ensuring enrollees' adherence to the recommended care elements and calling enrollees 48 hours after discharge. This longitudinal study was conducted over a period of two years to compare the COPD-related hospitalisation risk, hospital bed-days and healthcare costs incurred by the intervention and control groups; the generalised estimating equations methodology was used.

RESULTS The number of COPD-ICP enrollees who met the criteria for the all-or-none care bundle generally increased over the years, from July 2012 to December 2014. Compared to non-enrollees, enrollees had greater savings in the total number of hospital bed-days (p = 0.029) and significantly fewer hospital admissions (p = 0.001). Per enrollee, the programme led to savings of 0.3 admission and 1.1 hospital bed-days at the second year of intervention (i.e. approximately $663 cost savings per enrollee).

CONCLUSION The COPD-ICP programme was effective in providing tailored care for enrollees. It represents an innovative care model for coordinating care processes in Singapore, and is able to reduce healthcare utilisation and the cost of patient healthcare.

Impact of JurongHealth's Weight Management Programme on the clinical risk factors of people with obesity

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INTRODUCTION Participants of JurongHealth's multidisciplinary Weight Management Programme (WMP) were recently shown to have reduced their body weight by an average of 4.8%. This study aimed to evaluate whether the programme participants gained additional benefits, namely the reduction of other clinical risk factors.

METHODS Retrospective analysis was performed on 53 patients who completed the JurongHealth WMP. The clinical risk factors evaluated were waist circumference (WC), triglycerides (TGC), high-density lipoprotein-cholesterol and fasting blood glucose (FBG). International Diabetes Federation (IDF) cut-off values were used for the risk factors. The change in each risk factor was measured and its association with percentage weight loss analysed.

RESULTS Significant reduction (by 5.5 cm) was noted for WC only (95% CI −6.6 to −4.4, p < 0.001); FBG increased by 0.27 mmol/L (95% CI 0.055–0.48, p = 0.015). Percentage weight loss correlated to improvements in WC (r = 0.50, p < 0.001), TGC (r = 0.34, p = 0.015) and FBG (r = 0.29, p = 0.045). Before WMP, 42% patients had two of the four risk factors, with WC above the IDF cut-off value for all patients. After WMP, two patients lost WC as a risk factor. Although 26% of the patients managed to lose at least one risk factor after WMP, the number of risk factors did not change for 57% of the patients.

CONCLUSION Although the WMP had limited success in reducing the prevalence of risk factors among its participants, clinical improvements in WC were observed, suggesting a lowered risk of diabetes mellitus and mortality.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

Impact of a stroke care process redesign on the average length of stay in JurongHealth

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INTRODUCTION The transfer of stroke patients from an acute hospital to a community hospital is complex as it requires plenty of coordination and teamwork. Gaps in care processes could result in unnecessary days of hospital care. We aimed to assess the effects of a stroke care process redesign on the average length of stay (ALOS) at both Ng Teng Fong General Hospital (NTFGH), an acute care hospital, and Jurong Community Hospital (JCH), a community hospital.

METHODS Gaps in the care processes were identified prior to the process redesign. The following measures were adopted in the care process redesign: early initiation of referral to JCH, close collaboration between the stroke case manager and JCH's referral team through daily phone calls, early review by the JCH referral team and increased frequency of interdisciplinary case discussions to facilitate the smooth transfer of patients to either Rehabilitation Medicine or JCH. These interventions were implemented in March 2016. The primary outcomes measured were ALOS pre-intervention (October 2015–February 2016) and post-intervention (March 2016–May 2016), for NTFGH and JCH, both cumulatively and separately.

RESULTS ALOS reduction was 6.47 days for both hospitals (ALOS: 35.27 days pre-intervention and 28.80 days post-intervention). Pre-intervention, the ALOS was 9.31 and 25.96 days for NTFGH and JCH, respectively. Post-intervention, the ALOS was 7.68 and 21.12 days for NTFGH and JCH, respectively. ALOS reduction was 1.63 and 4.84 days for NTFGH and JCH, respectively.

CONCLUSION The care process redesign appeared to be effective in reducing the ALOS of stroke patients in both NTFGH and JCH.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

Improving mask-fitting rates among hospital staff: a workplace safety and health initiative

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INTRODUCTION An initiative to improve the rate of mask-fitting among the hospital staff (medical, nursing, allied health, ancillary and administrative) at Ng Teng Fong General Hospital was carried out. This study aimed to evaluate the effectiveness of the initiative after six months of its implementation.

METHODS The initiative was carried out from September 2013. As the main barrier to mask-fitting was identified to be the lack of a system to track and monitor compliance, staff from the Epidemiology Department were assigned to take on a coordinating role. Tasks include liaising with the department secretaries on the mask-fit status of their new staff, tracking attendance at the mask-fitting sessions conducted by the Infection Control Department and sending follow-up notifications to the department secretaries to ensure a high rate of compliance. After six months (i.e. in March 2014), data was collected to evaluate the effectiveness of the initiative.

RESULTS Significant improvements were observed after six months. The percentage of total staff who attended the mask-fitting session increased from 96% to 100%, and the percentage of total staff successfully mask-fitted increased from 95% to > 99%. Improvements in the percentage of staff who attended the mask-fitting session and the percentage of staff successfully mask-fitted were the highest among the medical doctors (61% to 100% and 60% to 99%, respectively). At the latest check (done in July 2016), the improvements gained were sustained.

CONCLUSION Having designated staff identify new employees, track mask-fitting status and send out timely reminders can significantly improve the mask-fitting rates among hospital staff.

Improving the precision of the diagnosis of hypertension through home blood pressure monitoring measurements

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INTRODUCTION A home blood pressure telemonitoring (HBPTM) pilot programme was introduced to residents who were identified with high blood pressure (BP) during community health screening events.

METHODS Programme participants were provided with BP meters, and taught how to use the BP meters and how to upload their BP readings. Participants did HBPTM over a seven-day period. The BP readings were tracked and a diagnosis was made by a doctor at the end of the monitoring period. A treatment suggestion would also be given at the end of the monitoring period. Case managers were trained to use the telemonitoring software. Care protocols were clearly communicated to the case managers so that they knew exactly when an intervention would be necessary. Logistics and ground operations were coordinated to accommodate the roll out of the HBPTM programme during the health screening events and to enable the collection of equipment after the end of the monitoring period. At the start of each health screening event, a briefing was conducted for the staff involved to highlight protocol changes and to clarify any doubts.

RESULTS Among the residents identified with high BP (n = 84), 44 (52.4%) were enrolled in the HBPTM programme. Among the 44 residents enrolled, 40 (90.9%) completed the programme and received a diagnosis; 20 were hypertensive and 20 were normotensive. 9.1% of the participants were not successfully diagnosed due to compliance errors.

CONCLUSION The precision of the diagnosis of hypertension can be improved through the use of HBPTM.

Improving housekeeping response time through system integration

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INTRODUCTION This study aimed to evaluate whether the integrated eHousekeeping Intelligent Management System (eHIMS) was able to improve housekeeping response time, as compared to the former process of manual activation of housekeeping. We hypothesised that eHIMS would result in a shorter lead time in activating housekeeping.

METHODS This study analysed the quantitative benefits eHIMS had on time savings, in terms of the time taken in making phone calls to the housekeeper and in locating the housekeeper. In eHIMS, when the nurse presses the button on the bed head panel to trigger a cleaning task, the housekeepers and their respective supervisors will be notified. Task details, such as the ward number, bed number and type of cleaning required, will be sent to the housekeepers' smartphones.

RESULTS The response time for cleaning tasks improved significantly after the implementation of eHIMS. More than 85% of the housekeeping response for discharge cleaning was within 30 minutes.

CONCLUSION eHIMS allowed the housekeeping team to closely monitor all cleaning tasks and thus, better prioritise tasks and deploy manpower. Timely updates of bed status enabled the prompt release of available beds to the next patient without delays. Shorter lead time in activating housekeepers ensures better turnover of discharge beds, which in turn shortens the waiting time in the Emergency Department.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

Is cook-chill the way forward for hospital food service?

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INTRODUCTION This study aimed to compare the total manpower requirements and costs of two food service systems, the cook-serve system and the cook-chill system, in a new hospital setting.

METHODS This study was conducted between June 2014 and December 2015, during the relocation of a 355-bed acute hospital to a new 1,100-bed hospital with both acute care and step-down care facilities. A simulation model with sensitivity analysis of both food systems was undertaken to estimate the manpower requirements and costs incurred over a period of 10 years. The analysis was done based on historical data from the old hospital and input on the expected workload at the new hospital. Manpower estimations were made based on mapped processes and time motion studies, with input from direct work supervisors and the human resource department.

RESULTS The potential cost savings that could be gained from using the cook-chill system, instead of the cook-serve system, in a 1,100-bed hospital was $2.6 million. The simulation predicted that a cook-chill system would incur higher capital investment, but have lower manpower costs.

CONCLUSION The cook-chill system is predicted to result in substantial cost savings and reduced manpower requirements. Operation efficiency is improved with the cook-chill system, as there is increased flexibility in task scheduling and less peak mealtime burden for the kitchen staff. The availability and cost of storage space for the cooked and chilled food is an important factor to take into consideration when considering the use of a cook-chill system.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

Ischaemic stroke thrombolysis experience in JurongHealth

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INTRODUCTION The use of intravenous recombinant tissue plasminogen activator (IV rTPA), within 4.5 hours of symptom onset, is an approved treatment for ischaemic stroke patients. The success of IV rTPA treatment depends on close, coordinated teamwork among the various disciplines.

METHODS A thrombolysis service was rolled out in phases at JurongHealth, in collaboration with the National University Health System, in August 2014. Currently, the service is available during working hours from Monday–Friday. The eligibility criteria, guidelines and workflow were established in collaboration with the Emergency, Radiology, Laboratory, Neurosurgery and Intensive Care departments. Data was collected prospectively for all stroke activations, from 1 August 2014 to 30 June 2016.

RESULTS There were a total of 60 stroke activations – 44 from the Emergency Department (ED), 13 from Inpatient and 3 from Jurong Community Hospital. Of the 60 activations, 12 eligible patients received IV rTPA (9 ED, 3 Inpatient). Among the 9 ED patients who received IV rTPA, 7 received it within 60 minutes of arrival to the ED. Among the 48 patients who did not receive IV rTPA, 17 had minor stroke, 8 were out of the window period, 7 had non-stroke, 6 had intracranial haemorrhage, 4 had transient ischaemic attack, 3 had poor premorbidity, 2 had rapidly improved symptoms, and 1 had haematoma of right hip with low haemoglobin.

CONCLUSION Eligible stroke patients should receive timely thrombolysis. The current pathway allows 20% of stroke patients to receive thrombolysis; the majority from the ED do so within 60 minutes of arrival to the ED.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

Mobile virtual training platform improves productivity and delivery of nursing education

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INTRODUCTION This study aimed to validate whether nursing education could be effectively delivered via a mobile application, so as to improve the reach of training and increase the number of nurses trained per in-service training module.

METHODS JurongHealth Virtual Nurse is a mobile application designed for nurses. It aims to facilitate learning through the simulation of clinical scenarios that require nurses to understand the context of the situation and make decisions. The 3D virtual environment and avatar's attire were modelled after Ng Teng Fong General Hospital so that the nurses could easily apply the knowledge they had learnt to their daily work. A variety of gameplay were utilised to assess the nurses' knowledge. A comparative study between the adoption of the mobile application and the attendance of conventional in-service classroom trainings was rolled out in October 2015 to 1,584 nurses over three months. Questionnaires were administered to the nurses who used the mobile application (test group) and the nurses who did not (control group) to assess learning and knowledge retention.

RESULTS There was a 17% improvement in learning outcomes, an improvement to the median participation rate in the training modules and approximately 720 training contact hours avoided in the test group.

CONCLUSION Improvement to learning outcomes suggests that, for selected content, nursing training can be conducted effectively through a mobile application. JurongHealth Virtual Nurse was able to reach a large number of nurses without logistic constraints. Compared to in-service training, the mobile application was able to train more nurses within the same period of time.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

Narrative review of psychosocial interventions for informal caregivers of stroke patients

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INTRODUCTION The abrupt onset of stroke creates permanent changes in the lives of the family members of stroke patients. Many family members have to suddenly fill a caregiver role, resulting in symptoms of depression and anxiety. Family members may feel abandoned and alone in their caregiver role after the patient is discharged home. As caregiver burden is often not addressed in the decision-making process for long-term stroke treatment, family members may also experience long-term financial burdens and loss of economic productivity. Medical social workers (MSWs) are well-positioned within existing stroke services to help caregivers cope better. We aimed to identify the psychosocial interventions used for caregivers of stroke patients from existing literature.

METHOD We searched PubMed, Google Scholar and Web of Science using the following terms and their permutations: "stroke", "psycho-social interventions" and "caregiver".

RESULTS Most post-stroke treatments focus on the physical rehabilitation of stroke patients, and appear to neglect the psychosocial needs of the patients and their families. Systematic reviews on psychosocial interventions for stroke patients and their families produced heterogeneous results that were inconclusive due to gaps in methodological reporting and small sample sizes. Current interventions focus on problem-solving skills. One study found that it helped to improve the sense of competency among caregivers. Poor information dissemination on post-stroke care contributes to poorer coping among caregivers post-discharge. Some stroke services use tools to assess the needs of newly-diagnosed stroke patients and/or their caregivers.

CONCLUSION Viewing the needs of caregivers and stroke patients as equal priorities can change the way MSWs plan and deliver interventions.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

Narrative review of psychosocial interventions for persons with dementia and the needs of their spousal caregivers

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INTRODUCTION The clinical practice guidelines for dementia published by the Ministry of Health, Singapore, in July 2013 covers 11 areas, including the management of behavioural and psychological symptoms of dementia, and community resources. Medical social workers (MSWs) in Singapore have been working in these areas, in existing multidisciplinary teams, to care for dementia patients. However, the interventions carried out by MSWs for the patients and their caregivers may be varied and inconsistent. This review aimed to gain insight, from published literature, on psychosocial interventions for persons with dementia and the needs of spousal caregivers of persons with dementia.

METHODS PubMed, Google Scholar and Web of Science were searched for eligible studies. The following terms were used: "dementia", "psychosocial interventions", and "caregiver".

RESULTS Many of the findings related to non-pharmacological interventions in dementia care could not be generalised due to small sample sizes and the use of a non-randomised control trial methodology. Although some findings related to complementary therapies and caregiver respite services were promising, they were not conclusive. The cohort studies and observational studies that were identified provided valuable, useful and descriptive information on the progression of dementia and the behaviours associated with each stage; however, they did not elaborate on the specific psychosocial interventions that can be carried out at the various stages of the disease.

CONCLUSION Our review revealed that information on psychosocial interventions for persons with dementia and the needs of their spousal caregivers are uncommon. As such information would be useful, more research needs to be done.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

Pre-analytical effects of a pneumatic tube system on clinical chemistry tests

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INTRODUCTION The use of a pneumatic tube system (PTS) to transport blood samples reduces turnaround time and the cost of hiring hospital portering staff. However, PTS may affect the quality of the samples. Haemolysis may occur due to the high transportation speed, sudden changes in the direction of the transport containers, and pressure exerted on the samples by the system. This study aimed to evaluate whether the quality of blood samples is affected when transported using our hospital's PTS.

METHODS Five blood samples (test group) were sent from Laboratory Medicine to five different locations (i.e. Emergency Medicine Department, Intensive Care Unit, Operating Theater, Specialist Outpatient Clinic and Inpatient Ward) via PTS; each location received one sample. The control group consisted of two blood samples that were kept in the laboratory and not subjected to PTS. Blood samples from both groups were centrifuged at 3,500 rpm for 10 minutes. Haemolysis index and quantitative clinical chemistry tests, including serum potassium, aspartate aminotransferase and lactate dehydrogenase, were determined using Abbott Architect C-16000. The results of both groups were compared. If the differences were within the total allowable error recommended by Clinical & Laboratory Standards Institute Guidelines, the quality of the samples was deemed acceptable.

RESULTS There were no significant differences in the serum blood parameters of the samples transported by PTS and the samples in the control group. The extent of haemolysis caused by PTS was negligible.

CONCLUSION Our hospital's PTS was able to transport blood samples without causing haemolysis or affecting the quality of the blood samples.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

Prevalence of sleep-disordered breathing in a multiethnic Asian population in Singapore: a community-based study

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INTRODUCTION There is limited data on the prevalence of sleep-disordered breathing (SDB) across different Asian ethnicities. This population study aimed to estimate the prevalence of SDB in Singapore, a multiethnic nation, and to quantify the prevalence variation among Chinese, Malays and Indians.

METHODS The Singapore Health Study 2012 was a cross-sectional population study involving adults aged 21–79 years. Among the 2,329 participants who completed the baseline examination, a sample of 242 participants completed the home-based sleep test with an Embletta® device (type 3 monitor). Moderate-to-severe SDB, defined as an apnoea-hypopnea index (AHI) ≥ 15 events/hour, was used to estimate prevalence.

RESULTS The weighted estimate of the population prevalence of moderate-to-severe SDB and sleep apnoea syndrome were 30.5% and 18.1%, respectively. Among the participants with AHI ≥ 15, 91.0% were previously undiagnosed. The prevalence of moderate-to-severe SDB was varied across the ethnicities – Chinese: 32.1%, Malays: 33.8% and Indians: 16.5%. The mean body mass index (BMI) was lowest among the Chinese (23.3 kg/m²), and highest among the Malays (26.0 kg/m²) and Indians (25.4 kg/m²). Compared to the Chinese, the Indians had lower odds of moderate-to-severe SDB after adjustments for age, gender and BMI (OR 0.82, 95% CI 0.70–0.96, p = 0.02).

CONCLUSION SDB is prevalent, but mostly undiagnosed among Asians in Singapore. The prevalence of SDB was lower among the Indians than the Chinese after adjusting for age, gender and BMI. Strategies are needed to optimise the diagnosis of SDB and clinicians should be made aware of the ethnic differences in SDB prevalence.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

Predicting obstructive sleep apnoea in a Singapore population using the STOP-Bang questionnaire

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INTRODUCTION The STOP-Bang questionnaire is a quick and simple screening tool for obstructive sleep apnoea (OSA). It was developed for use in preoperative clinics. We aimed to evaluate the validity of the questionnaire in predicting moderate-to-severe and severe OSA in a Singapore population.

METHODS A sample of 242 patients was selected from a population-based cohort study conducted in Singapore. These 242 patients completed a home-based sleep test using a type 3 monitor. They also completed the STOP-Bang questionnaire and had their BMI, age, neck circumference and gender recorded. Patients were classified to have high-risk OSA if their STOP-Bang score was ≥ 3.

RESULTS Of the 242 patients, 68 (28.1%) and 26 (10.7%) had an apnoea-hypopnea index (AHI) ≥ 15 and ≥ 30 events/hour, respectively; 89 (36.8%) were classified to have high-risk OSA. The sensitivity of the STOP-Bang score ≥ 3 was 66.2% for detecting AHI ≥ 15 and 69.2% for detecting AHI ≥ 30; the corresponding specificities were 74.7% and 67.1%, respectively. The NPVs for moderate-to-severe OSA and severe OSA were 85% and 94.8%, respectively; the corresponding PPVs were 50.6% and 20.2%, respectively. Use of 30 kg/m² and 27.5 kg/m² as the BMI cut-offs for Asians (instead of the original 35 kg/m²) did not improve the questionnaire performance significantly.

CONCLUSION The STOP-Bang questionnaire can be used as a screening tool in a Singapore population, as it has moderate sensitivity and high NPV for moderate-to-severe and severe OSA. Adjustment of the BMI cut-off value for use in an Asian population did not seem necessary.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

Predicting patient demographics and prescription factors that may contribute to requests for rework during dispensing at an outpatient satellite pharmacy in a general hospital

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INTRODUCTION Some patients who have indicated the quantity of medication(s) for collection at registration subsequently change their minds at dispensing. This causes additional work, increasing the time spent with the patient, which consequently affects the waiting time of other patients in the pharmacy. Knowledge of predisposing factors will allow registration counter staff to pay additional attention to such patients, to reduce the probability of the patients requesting for rework at dispensing. We aimed to identify these predisposing factors.
METHODS Dispensers recorded the NRICs of patients who requested for rework at dispensing. The NRICs were crosschecked against the patients' demographics and prescription factors. Information on the patients' age and gender, number of medications, amount payable, duration of supply and medical specialty were extracted. Binary

linear regression statistical analysis was used to determine the relative strength of these factors in terms of probability of rework.
RESULTS During a period of 63 business days, 6,429 prescription episodes were analysed. A change in the initial order was made at dispensing by 241 (3.75%) patients. Patients with a higher number of medications, a longer duration of medication, a more advanced age and prescriptions from general medicine, respiratory and rheumatology were more likely to request for rework at dispensing. Amount payable and gender did not affect the probability of rework.
CONCLUSION Several factors were found to be related to the likelihood of patient-requested rework at dispensing. A further study will be conducted to test our hypothesis that paying additional attention to patients with these factors at registration can reduce the amount of rework.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

Psychometric properties of SCALE+ and SCALE+[SPR]: a concurrent validity and inter-rater reliability study

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INTRODUCTION Singapore Context Assessment of Home Living and Environment-Plus (SCALE+) and its corresponding self- and proxy-rated form (SCALE+[SPR]) were developed to screen for falls risk factors in the homes of community-dwelling elderly persons in Singapore. This study aimed to further refine and examine the psychometric properties of SCALE+ and SCALE+[SPR].
METHODS Three components were analysed: (a) the concurrent validity of SCALE+ and the Home Falls and Accidents Screening Tool (HOME FAST); (b) the degree of agreement between SCALE+ and SCALE+[SPR]; and (c) the inter-rater reliability (IRR) of SCALE+ among non-clinicians. Questionnaires were refined, by removing branching and double negative phrasing, to provide clarity. Participants were recruited via purposive convenience sampling. Data collected was analysed using SPSS.
RESULTS Strong positive correlation was observed between SCALE+

and HOME FAST (Pearson coefficient = 0.605; p < 0.01). Individual scores between matched questions were correlated using Cohen's Kappa ($\kappa = -0.043$ to 0.906). In terms of IRR between clinicians and clients, 21.7% had fair agreement ($\kappa < 0.4$) and 78.3% had moderate-to-substantial agreement ($0.4 \leq \kappa \leq 0.80$). There was disagreement (43.5%–78.3%) regarding the perception of home hazards in 30.0% of the questions. Moderate agreement was observed for IRR among non-clinicians (Fleiss Kappa; $\kappa1 = 0.58$, $\kappa2 = 0.56$).
CONCLUSION SCALE+ is a valid tool for assessing falls risks factors among community-dwelling elderly persons in Singapore. Non-clinicians (e.g. volunteers) could be trained to use this tool to identify fall risks. Further studies are needed to understand why the ratings by the clients on perceived home hazards were lower than that of the clinicians. We recommend further refinement to the questionnaires and the development of detailed training procedures.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

Reduction of medication errors with the introduction of a smart e-medication cart

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INTRODUCTION This study aimed to investigate whether the introduction of a smart e-medication cart would be able to reduce the rate of medication errors as compared to the use of a conventional medication cart.

METHODS This study was carried out from July 2014 to March 2016. The conventional medication cart was replaced with a smart e-medication cart in the existing closed loop medication management from July 2015. Thus, data on medication error collected from June 2014 to June 2015 reflects that of the conventional medication cart system, while data collected from July 2015 to March 2016 reflects that of the smart e-medication cart system. In the conventional medication cart system, a conventional medication cart was used and a manual workflow was in existence; the nurses manually label the drawers and the pharmacists top up the medications.

RESULTS There was a sharp reduction in number of mean number of medication errors monthly (by 63%), from 0.2683/1,000 patient day to 0.099/1,000 patient day, after the introduction of the smart e-medication cart. There was also increased stability in the process of medication delivery to the patient; the range of lower control limit and upper control limit declined by more than threefolds, from 0.3108/1,000 patient day to 0.0994/1,000 patient day, after the introduction of the smart e-medication cart.

CONCLUSION This study showed that the introduction of the smart e-medication cart resulted in reduced medication errors and less fluctuations in medication errors.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

Reliability of the Subjective Global Assessment administered by dieticians and diet technicians

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INTRODUCTION Hospitalised patients are screened for malnutrition risk within 24 hours of admission. Those identified to be at risk will be referred for further assessment using the Subjective Global Assessment (SGA). Patients are then categorised into three groups, SGA-A (well-nourished), SGA-B (mildly–moderately malnourished) and SGA-C (severely malnourished), based on their medical history and physical examination results. Traditionally, SGA is administered by dieticians. The reliability of SGA when administered by diet technicians, instead of dieticians, has not been assessed previously. This study aims to fill this knowledge gap and to determine the cost-effectiveness of diet technician-administered SGA.

METHODS As per routine, patients deemed to be at risk of malnutrition will be referred to the Dietetics Department. However, instead of having only a dietician administer the SGA, a diet technician and a dietician will perform the SGA in a random and blinded fashion. The reliability of the SGA between the dietician and the diet technician will be measured using Cohen's kappa. The results of a local study was used to calculate the required sample size. Assuming that the kappa between the dietician and the diet technician is 0.90; the kappa under the null hypothesis is 0.58; the marginal probabilities for SGA-A, SGA-B and SGA-C are about 71%, 25% and 4%, respectively; and the chance of committing type 1 and type 2 errors are 5% and 20%, respectively; we would require 56 patients (28 for the dietician and 28 for the diet technician). This project commenced in September 2016 and was ongoing at the time of writing.

Referral pattern to a local sleep breathing disorder clinic

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INTRODUCTION Obstructive sleep apnoea (OSA) is a highly prevalent, yet under-recognised, chronic disorder that is associated with increased morbidity and mortality. It is characterised by upper airway obstruction, hypoxaemia and sleep fragmentation mediating sympathetic hyperactivity, endothelial dysfunction and multi-organ inflammation. Due to its multisystem manifestation, patients with OSA can present to a wide range of specialties with symptoms related to, caused by, or exacerbated by OSA. Clinicians need to be aware of the various ways OSA may present in their discipline to be able to diagnose it. This study aimed to identify the referral pattern to local sleep clinics for OSA evaluation and to identify target specialties for education.

METHODS This retrospective study was conducted at two local hospitals. We included all adult patients who were referred to sleep clinics for suspected OSA from May 2012–August 2015 (n = 668).

The patients' clinical records, including data on referral source and apnoea-hypopnea index (AHI) from polysomnography, were reviewed and summarised. Statistical analysis was done using IBM SPSS Statistics version 21.0.

RESULTS Most patients were referred from the following specialties: primary care (20.2%); otolaryngology (17.2%); cardiology (12.1%); neurology (7.3%); and respiratory (5.2%). The referral rates from endocrinology, gastroenterology, psychiatry, general medicine, anaesthesia and dentistry were collectively less than 5%. A large proportion (96.3%) of the patients had polysomnographically-confirmed OSA (AHI ≥ 5).

CONCLUSION Primary care and otolaryngology had the highest referral rates. Low referral rates from the other disciplines may imply a lack of awareness of OSA and a need for targeted education in these disciplines.

Streamlining data management of certification records and improving compliance rates for basic and advanced cardiac life support courses

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INTRODUCTION A master list of the basic and advanced cardiac life support (BCLS and ACLS) course certification records was created so that the data management process for the tracking of certification compliance rates could be streamlined and targeted interventions could be introduced to improve certification compliance rates. This study aimed to assess the effectiveness of this initiative.

METHODS A master list with spreadsheet formulae was used to automate the process of updating certification records. Stratification analysis of certification compliance rates by department allowed targeted reminders to be sent directly to the departments to inform them if their staff had yet to obtain certification, or had expiring or expired certifications. A plan-do-study-act cycle was used to implement the

change and to track improvement. The certification compliance rates were tracked every quarter.

RESULTS The master list reduced the number of steps needed to consolidate and update the certification records. It also eliminated errors that might have occurred from updating the records manually. Through targeted interventions, the BCLS certification compliance rates improved from 78% (pre-master list) to 85% (post-master list), while the ACLS certification compliance rates improved from 51% (pre-master list) to 79% (post-master list).

CONCLUSION The introduction of a master list made the data management process more consistent and efficient. It also aided in the identification of issues, leading to targeted interventions, which helped to improve the BCLS and ACLS certification compliance rates.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

Strategies to improve slide review turnaround time performance

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INTRODUCTION Turnaround time (TAT) is a popular laboratory key performance indicator. The TAT targets for urgent and routine full blood count (FBC) with slide review are 1 hour and 3 hours, respectively. Abnormal FBC results are verified by medical technologists after slide review with morphology reporting. A retrospective study of weekly slide review TAT, conducted from 4 January–27 March 2016, showed that the mean TAT for urgent and routine cases were 86.7% and 84.8%, respectively; both were below the 95% target. Slide review with morphology reporting was the major contributor to delayed TAT for FBC with slide review. To improve TAT, we adopted strategies to standardise slide review reporting and to distinguish the scope of reporting between peripheral blood films and slides reviews.
METHODS We streamlined slide review reporting, establishing the following clear goals: (a) validation of FBC results; and (b) identification of haematologic emergencies (i.e. microangiopathic haemolytic anaemia, malaria parasites, sickle cell crisis and acute leukaemia). Training was conducted by morphology trainers, to familiarise staff with the new workflow and the morphologic features of haematologic emergencies. A pilot run was held from 15 April–18 August 2016 and feedback was collected.
RESULTS Weekly slide review mean TAT performance from 1 May–14 August 2016 showed significant improvement (97.2% for urgent cases and 99.4% for routine cases). Staff feedback was positive.
CONCLUSION Streamlining slide review reporting improved slide review TAT, with the resulting TAT exceeding 95%. The new workflow will be formally implemented on 1 September 2016.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

Stroke severity assessment by stroke nurses using the National Institutes of Health Stroke Scale: an experience at Ng Teng Fong General Hospital

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INTRODUCTION Nurse-administered assessments facilitate the gathering of important clinical information. Globally, the assessment of stroke severity is done using the National Institutes of Health Stroke Scale (NIHSS). NIHSS is a simple and internationally validated tool that can be administered at the bedside. It can be used to predict the outcome of stroke patients and thus, help the prioritisation of inpatient healthcare delivery and the administration of appropriate interventions, to achieve favourable patient outcomes. This study aimed to determine the stroke severity of patients using NIHSS (mild, moderate or severe), and to evaluate the mortality and end disposition of the patients in each category.
METHODS For the purpose of analysis, NIHSS results were divided into three subcategories: mild stroke (score < 6); moderate stroke (score 6–15); and severe stroke (score > 15). Data was collected from 1 July 2015 to 30 June 2016.
RESULTS A total of 462 ischaemic stroke patients were admitted during the study period; 324 (70%) had mild strokes, 106 (23%) had moderate strokes and 32 (7%) had severe strokes. Among the patients with mild strokes, 90 (28%) were transferred to a rehabilitation facility. Among the patients with moderate and severe strokes, this number was 50 (47%) and 8 (25%), respectively. The proportion of patients with mild, moderate and severe strokes that were discharged home from acute care were 225 (69%), 31 (29%) and 9 (28%), respectively. The mortality rate was 0.3% among the patients with mild stroke, and 4.7% and 21.9% among the patients with moderate and severe strokes, respectively.
CONCLUSION Nurse-administered NIHSS enabled practitioners to predict prognosis, and plan the management and early transfer (to a rehabilitation facility) of stroke patients.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

The effect of bed occupancy rate on the waiting time for admission to ward in an emergency department: an observational study in an acute hospital setting

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INTRODUCTION The emergency department's waiting time (ED WT) to admission is the most recommended performance indicator of operational efficiency. It has a direct influence on patient care and safety. This study aimed to examine the relationship between inpatient bed occupancy rate (BOR) and ED WT to admission, in an acute tertiary hospital setting.
METHODS This was a retrospective observational study. Data was collected for 84 consecutive days in a 600-bed acute tertiary hospital with an annual ED census of around 84,000 ED attendances. Logistic regression was done to identify the predictors of ED WT to admission.
RESULTS During the study period, the average daily number of ED attendances was 260 and the average daily admission rate was 33%.

The overall BOR was 77%. The 50th and 95th percentile ED WT to admission were 1.7 hours and 3.8 hours, respectively. Inpatient BOR was found to be an important predictor of 95th percentile ED WT to admission (OR 1.5, 95% CI 1.2–2.0). The 95th percentile ED WT to admission starts to exceed 4 hours after a BOR of 85%. After a BOR of 87% (inflection point), there is an exponential rise in the 95th percentile ED WT to admission, with the difference between 50th and 95th percentile ED WT becoming increasingly wide.
CONCLUSION BOR affects the ED WT to admission. Identification of the BOR inflection point can help offer insights on how to improve resource allocation, so as to maximise the operational efficiency of the ED.

CATEGORY: HEALTH SERVICES RESEARCH AND QUALITY IMPROVEMENT

The effectiveness of patient education on the rehabilitation outcomes of adults with carpal tunnel syndrome: a systematic review

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INTRODUCTION This study aimed to evaluate the effectiveness of patient education on the rehabilitation outcomes of adults conservatively managed for carpal tunnel syndrome (CTS).
METHODS A systematic search was conducted on CINAHL, PubMed, Medline and ProQuest for published English-language articles up until 2014. Eligibility assessment was conducted independently by one of the authors and two reviewers. Studies that had any form of education intervention, with outcomes and symptom severity reported, were included. No restrictions were placed on symptom duration and type of participants. Studies involving surgical repair were excluded. A data extraction sheet was used and the quality of the studies was assessed independently by two reviewers using an assessment tool checklist.
RESULTS Six studies, involving 500 participants, were identified (five randomised controlled trials [RCTs] and one pre-test/post-test

trial). The quality of the studies was strong; the five RCTs scored above 80 (very strong) and the pre-test/post-test trial scored above 50 (adequate). Three studies involved education and splinting vs. education alone, while three involved education, splinting and exercises. There were significant differences in the type, frequency, duration and method of delivery of education. Only one RCT demonstrated conclusive evidence on the effectiveness of ergonomic education alone with statistically significant improvement in symptom severity.
CONCLUSION The relationship between patient education and rehabilitation outcomes among CTS patients were inconclusive, as there was a lack of analysis on the effects of education alone and the absence of a specific outcome related to education (e.g. patient knowledge). More RCTs should be conducted to analyse the effectiveness of patient education.

The use of knowledge management stages to streamline prescription processing at Ng Teng Fong General Hospital's outpatient pharmacy

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INTRODUCTION Processing an outpatient prescription is a multistep process. The clinical check (CC) component is a crucial step, as it ensures the safety of the medications for patients. Observations reveal large variations in the method used and the time taken by pharmacists to perform CCs.

METHODS Knowledge management (KM) stages (initiate, share, establish, exploit) were used to capture tacit knowledge used in CCs. A qualitative approach was employed. Pharmacists with ≥ 3 years of experience were observed processing prescriptions in a classroom setting and focus group interviews were conducted to establish the essential steps in the CC component. Leaders guided group discussions that covered different scenarios and different medical specialties. Knowledge shared was deliberated and a standardised CC guideline was established. The guideline was trialled by pharmacists over six months, with post-implementation feedback sought to determine ease of use and time saved.

RESULTS All of the pharmacists agreed to the points in the guideline. It was found to be very useful, with 90% of the pharmacists using the guideline on a daily basis. Efficiency also improved; 80% of the pharmacists who used the guideline found that they required less time to check a prescription for safety (processing time was reduced by 1–6 minutes). The wait-time target was met within six months of implementation and sustained, despite an 82% increase in prescription load, comparing August 2015 (pre-implementation) and June 2016 (post-implementation).

CONCLUSION Staff's knowledge, which can be captured using KM stages, can be used to resolve operational issues, such as a progressively increasing workload.

Understanding the geographical distribution of patients attending Ng Teng Fong General Hospital

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INTRODUCTION JurongHealth aims to deliver seamless care to the population living in the areas covered under JurongHealth's Regional Health System (RHS). Since the opening of Ng Teng Fong General Hospital (NTFGH), there has been a steady increase in the number of patients coming to the hospital for treatment. However, it is unclear if these patients are living in the areas covered under JurongHealth's RHS. This study explores the distribution of the patients attending NTFGH.

METHODS The postal codes of patients who attended NTFGH over two time periods (30 June 2015–29 February 2016 and 30 June 2015–14 August 2016) were extracted from the SAP system and converted into geographical coordinates. We then created heat maps for the two periods by plotting the coordinates on the maps using the open source online platform, CARTO. Residential areas were coloured with gradients, ranging from dark red to light yellow, to differentiate the areas with a high density of patients from the areas with a low density of patients.

RESULTS Most of NTFGH's patients resided within the areas covered under JurongHealth's RHS. When the two heat maps were compared, we observed an increase in the number of patients from the North and Jurong industrial areas.

CONCLUSION The heat maps served as a useful tool for visualising the distribution of NTFGH's patients over time. We hope to gain further insights on the geographical distribution of the patients, in terms of patient demographics and common disease diagnoses.

30-day readmission predictive care model pilot in JurongHealth

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INTRODUCTION A predictive care programme helmed by a multidisciplinary team was implemented in JurongHealth. It aimed to reduce unplanned hospital readmissions through the identification of high-risk patients on Day 2 of the patients' index admission, to deliver early intervention before the patients were discharged and readmitted.

METHODS Using the Framingham risk score algorithm, a risk score index incorporating relevant clinical and social predictors was developed to calculate each patient's predictive risk score (0–26). The predictive care model pilot in Alexandra Hospital achieved 76% accuracy in identifying high-risk patients. Patients with a risk score of ≥ 13 (high-risk) were flagged on Day 2 of admission and assigned to case managers in relevant disciplines for intervention. An enhanced predictive care model, which was implemented in Ng Teng Fong General Hospital (NTFGH) since July 2016, achieved a discriminatory power of 86% in identifying high-risk patients.

RESULTS With the predictive care model pilot, more patients (from 47% to 100%) were referred to care teams, with 55% assigned to case managers and medical social workers. There was a statistically significant reduction of 10% in the high-risk patients' readmission rate ($p = 0.001$) and a 1% overall reduction in the medicine patients' readmission rate ($p = 0.197$). There were savings of 442 and 645 bed-days for high-risk and all patients, respectively. In NTFGH, the first month implementation led to a reduction in the high-risk patients' readmission rate (from 47% to 40%).

CONCLUSION The results of the predictive care model programme suggests that the model is effective in reducing healthcare resources; it does this through the accurate identification of high-risk patients and the implementation of evidence-based care elements.