Singapore General Hospital
SingHealth

Nursing Research & Innovation Year 2020 in Review

ACHIEVEMENTS

Grants received
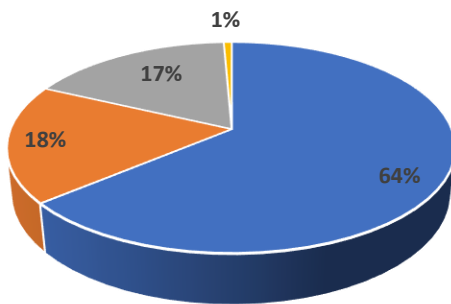
- **National** 64%
- **Research** 18%
- **Innovation** 17%
- **Others** 1%

$448,450
In quantum of **grants awarded**

9 Grants

33 Publications

Innovation Grants
- SingHealth Duke-NUS Surgery Academic Clinical Programme Clinical & Systems Innovation Support Grant
- SingHealth Duke-NUS COVID-19 Innovation Grant
- SGH COVID-19 Resilience Innovation Grant

National Grants
- Green Buildings Innovation Cluster R&D Scheme

Research Grants
- SGH Research Grant
- Academic Medicine (AM) Research Grant
- SingHealth RHS (PULSES) Centre Grant

Others
- SGH Health Development Fund

Research Focus Areas

- Nursing Care Outcomes (page 2-4)
- Nursing Workforce (page 5-7)
- Care Transformation (page 8)
- Caregiver well-being, education & coping (page 9)
- Innovation (page 10-12)
- Evidence-Based Nursing (page 13-14)
- Publications (page 15-17)

Nursing Research in the News

We have incorporated technology in daily nursing care which was useful for patients during the COVID pandemic. New wards were created in a short time, and the use of technology has helped patients and healthcare workers.

(Top Far Left) "New isolation ward more than doubles isolation rooms in SGH" featured in Straits Times 14/07/2020.

(Left) "Local version of isolation ward built within a span of 6 weeks in Singapore General hospital" featured in Lianhne Zaobao on 15/07/20202.
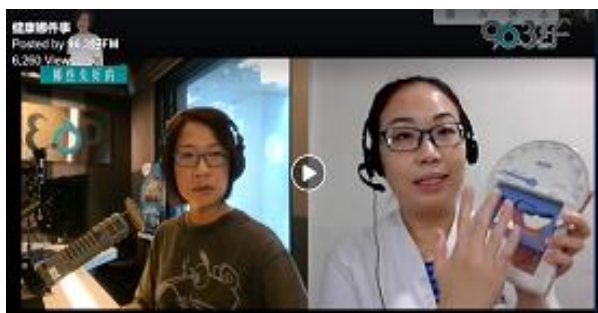
(Bottom) "SGH Nurse on improving elderly's frailty outcomes"-Sharing on how psychosocial elements such as resilience can improve the outcomes of frailty in the elderly. Air casted in 96.3 Hao FM 2/11/2O2O.

Nursing Care Outcomes

STUDY STATUS: IN PROGRESS

Project title: Screening for Frailty in Hospitalized Older Adults: Comparative analysis of the Validity, Reliability and Feasibility of three screening tools

Aims: (1) Assess the discriminative ability, based on comparison of the area under the curve (AUC) of three frailty screening tools: FAM, Frail-PPS, and ISAR-HP-for identifying hospitalised older adults at risk of a composite adverse health outcome within three months of discharge from the hospital; (2) determine the inter- rater reliability of the frailty screening tools; and (3) evaluate the efficiency of the screening tools in terms of the time required of administration.

Methods: A cross-sectional study is being conducted with adult patients aged 65 years and older, over one year whereby a total of 369 patients will be recruited within 24 hours of admission. Comparison of discrimination ability in identifying older patients at risk for the functional decline, admission to the nursing home, requiring a full-time caregiver and mortality, will be conducted. Inter-rater reliability between different grade of nurses and the average time needed for the administration of the screening tools was conducted with a sample of 50 patients. The efficiency of the different screening tools will be determined by recording the time required to administer three tools in a target sample of 50 patients.

Study significance: A valid, reliable and efficient frailty screening tool will be identified to ensure early identification of frailty and implementation of early interventions.

Project team members: Dr Lim Siew Hoon (Nursing Division), A/Prof Rahul Malhotra (Duke-NUS), Prof Truls Ostbye (Duke-NUS), Dr Orlanda Goh (MOHH), Ms Ang Shin Yuh (Nursing Division), Ms Fazila Aloweni (Nursing Division), Ms Yumi Teo Jing Xuan (Nursing Division), Ms Clara Lee Sze Chung (Nursing Division), Ms Cherry Pincel Bacani (Nursing Division), Ms Siti Nadiah Binte Yahya (Nursing Division), Ms Daphne Gay (Division of Medicine), Ms Siti Khadijah Bte Zainuddin (Nursing Division), Ms Nur Liyana Bte Agus (Nursing Division).

Project title: Comparative effectiveness of a novel crusting method versus standard barrier cream in the treatment of incontinence-associated dermatitis among adult patients in an acute care setting — a randomised controlled trial

Aims: To determine the prevalence rate of patients with incontinence-associated dermatitis (IAD) and evaluate the effectiveness of crusting method in treating IAD compared to standard care.

Methods: Patients diagnosed with IAD by speciality wound nurses in SGH will be randomly allocated to either the crusting method or control group. Patients in the crusting method group will receive gentle cleansing of the affected skin area with a mild cleanser, application of absorbable powder protective film barrier and Cavilon barrier film spray. Patients in the control group will receive gentle cleansing of the affected skin area with mild cleanser and application of 30% zinc oxide barrier cream.

Study significance: The findings of the study will allow us to change practices and standardise our IAD care protocol in SGH and local healthcare institutions. Furthermore, it will hasten the healing process, and the patient will experience less IAD – related complications, as well as pain during IAD treatment.

Project team members: Ms Nanthakumahrie D/O Gunasegaran (Nursing Division), Prof Upton Zee (Agency for Science Technology & Research), Mrs Sri Sukarti Bte Mostafa Bin Abdollah (Nursing Division), Ms Fazila Aloweni (Nursing Division), Ms Ang Shin Yuh (Nursing Division), Ms Chang Yee Yee (Nursing Division), Ms Liew Yi Jia Angela (Nursing Division), Ms Tan Wei Xian (Nursing Division), Dr Ng Yi Zhen (Skin Research Institute of Singapore), Ms Nur Liyana Binte Agus (Nursing Division), Ms Saliza Binte Mohamed Said (Nursing Division), Ms Lai Yean Ling (Nursing Division), Ms Leni Guanzon Fernandez (Nursing Division), Ms Lee Chee Woei (Nursing Division).

Project title: Redefining frailty with resilience and self-efficacy in older adults and caregivers in acute care context

Aims: (1) To explore the perceptions and beliefs of frailty in hospitalised older adults and their caregivers, and (2) to understand the roles of resilience and self-efficacy in frail older adults hospitalised in the acute care context, and establish a new model utilising resilience and self-efficacy in the concept of frailty.

Methods: A grounded theory study design is adopted where 50 patients-caregivers' dyads from the largest acute care hospital in Singapore will be recruited. Open-ended interviews will be conducted to allow a deep understanding of the meaning of resilience and self-efficacy through individual stories. Grounded theory framework will be used to analyse the transcribed interviews. Nvivo software will be integrated to consolidate and code the theme of the findings.

Study significance: Exploration of older adults' and their caregiver's perceptions and beliefs of frailty is vital for healthcare professionals to understand their needs and develop appropriate interventions to improve outcomes of frailty in hospitalised elderly in Singapore.

Project team members: Dr Lim Siew Hoon (Nursing Division), Ms Fazila Aloweni (Nursing Division), Ms Thendral Uthaman (Nursing Division), Ms Nur Liyana Bte Agus (Nursing Division).

Project title: Hypoglycaemia management post hyperkalaemia treatment with insulin in an acute care tertiary hospital-a quality improvement project

Aims: (1) To determine the incidence of hypoglycaemia in adult patients treated for hyperkalaemia with insulin at an acute care hospital; (2) to evaluate associating factors related to the development of hypoglycaemia in adult patients treated for hyperkalaemia with insulin.

Methods: Patients admitted between September 2020 and September 2021 who received intravenous insulin from hyperkalaemia order set will be included in this study and reviewed prospectively. A structured BGM protocol will be implemented based on the best evidence from current hyperkalaemia clinical guidelines. Patient's demographic including age, gender, race, body mass index, admitting diagnosis, length of hospital stay, past medical history, current medications, diet status, and intravenous infusion administered, will be documented from the medical records. Data review from these patients will consist of: (i) Hyperkalaemia episodes (≥ 5.5 mmol/L) given insulin and glucose administration-pre- and post-treatment serum potassium level; (ii) BGM results including hypoglycaemia episodes (≤ 3.9 mmol/L) and severe hypoglycaemia episodes (≤ 2.8 mmol/L).

Study significance: Results of this audit aim to improve patient safety by establishing a monitoring protocol to aid in early detection of hypoglycaemia and understand relating risk factors.

Project team members: Dr Lim Siew Hoon (Nursing Division), Dr Teh Ming Ming (Dept of Endocrinology), Ms Tan Kai Hui Co-I (Dept of Pharmacy), Ms Fazila Aloweni (Nursing Division), Ms Ang Shin Yuh (Nursing Division), Ms Li Hui Cai (Nursing Division), Ms Sum Hsin Yin Claire (Nursing Division), Ms Chong Shuk Tyng Stephanie (Dept of Pharmacy), Ms Raden Nurheryany (Nursing Division).

STUDY STATUS: COMPLETED

Project Title: An integrative review: impact, acceptability, and feasibility of virtual reality on adult patients in acute care settings undergoing surgical procedures

Aims: To evaluate the outcomes and effectiveness of different types of virtual reality (VR) therapy received by adult patients undergoing surgical procedures in acute care settings, and to highlight the acceptability and feasibility of VR approaches among patients and health care workers.

Methods: Whittemore and Knafl's integrative review method guided the analysis. Searches were conducted in ScienceDirect, ProQuest, Wiley Online Library, Medline, PsycINFO and PubMed and Google Scholar for the years 2009 to 2019. Keywords searched included primary qualitative and quantitative studies that utilised VR therapy in surgical care settings.

Results: Twelve articles were reviewed, which reported the use of two main strategies: guided and interactive imagery therapy. Findings identified: (i) patient-clinical outcome measures including the use of analgesics, vital signs, functional capacity, and length of hospital stay; and (ii) patient-reported experience measures including pain, anxiety and satisfaction level. Comfort, age, knowledge, and attitude were key factors influencing the acceptability of VR among the patients, whereas cost-effectiveness and infection control were two main factors affecting the feasibility of use among the health care workers.

Study implications: VR therapy demonstrated potential improvements in both the patient-clinical outcomes and patient-reported experiences of those undergoing surgical procedures.

Project Team Members: Wang Shuli (Nursing Division), Ms Fazila Aloweni (Nursing Division), Dr Lim Siew Hoon (Nursing Division)

Project Title: A Prospective Comparative Study on the Effectiveness of Two Different Non-Adherent polyurethane Dressings on Split-thickness Skin Graft Donor Sites

Aims: To analyse differences in exudate absorbency, ease and pain on dressing removal and epithelisation between Allevyn and Betaplast.

Methods: Patients in the general ward undergoing Split Skin Graft (SSG) were recruited. Allevyn and Betaplast were applied on the same donor site after SSG harvesting. Dressings were secured using OPSITE film and bandage. Absorptive capacity was assessed daily using an absorbency grading chart. Dressing change was done on post-operative day (POD) 5. Ease of dressing removal was assessed with a visual chart, and pain score using the Wong-Baker Pain Scale. The percentage of full re-epithelisation in terms of surface area for each dressing was assessed.

Study implications: Betaplast seem to have a better clinical outcome compared to Allevyn in this sampled population. Nurses may consider using Betaplast for SSG.

Project team members: Ms Darshini Devi Rajasegeran (Nursing Division), Ms Fazila Aloweni (Nursing Division), Dr Chong Si Jack (Dept of Plastic, Reconstructive & Aesthetic Surgery, Medicine), Ms Lim Xinyi (Nursing Division), Ms Saranya Chandra Sekaran (Nursing Division), Ms Zhang Lei (Nursing Division), Ms Lim Li Pin Brenda (Nursing Division), Dr Kok Yee Onn (Dept of Plastic, Reconstructive & Aesthetic Surgery, Medicine).

Nursing Workforce

STUDY STATUS: IN PROGRESS

Project Title: Understanding the impact and perception of infection control practices of healthcare workers during the COVID-19 pandemic

Aims: (1) To determine the prevalence of adverse skin reactions of PPE of Singapore General Hospital (SGH) healthcare workers (HCWs) during the COVID-19 outbreak in Singapore including a. Usage frequencies, b. Medical device-related pressure injuries c. Self-care, d. Patient care interference; (2) to determine the perception of healthcare workers on the access to PPE supply and the potential exposure to the infection and guidance on PPE use including a. Perception of access to PPE supply, b. Likelihood of own exposure to infection, c. Perception of adequacy in PPE the training.

Methods: A cross-sectional study will be adopted, using a questionnaire to conduct online surveys for the healthcare workers in SGH. A population-based sampling approach will be employed. All healthcare staff who meet the study eligibility criteria will be invited to participate. An estimated 500 responses will be collected. Descriptive statistics will be applied to analyse demographic data. Inferential statistics such as regression techniques will be used to explore the association of outcomes measure across different healthcare worker groups.

Study significance: This study will inform the extend of PPE-related effects on our frontline HCWs during the COVID-19 outbreak and the type of support and education needed to alleviate it.

Project Team Members: Ms Fazila Aloweni (Nursing Division), Ms Toh Hui Xian (Nursing Division-Infection Control), Ms Ang Shin Yuh (Nursing Division), Ms Nur 'Azzah Suhari (Nursing Division), Ms Raden Nurheryany (Nursing Division), Dr Lim Siew Hoon (Nursing Division).

STUDY STATUS: COMPLETED

Project Title: The impact of a change in rostering practices on absenteeism: A retrospective study

Aims: To compare the rates of absenteeism before and after a change in rostering practice.

Methods: A retrospective design was used to collect sick leave data six months before the change in rostering practice to twelve months after. The average number of sick leave per month before and after the change were compared. Nursing hours per patient day data was also collected.

Results: An increase in the number of sick leave was seen in three out of five wards following the change in rostering practice. Average sick leave across five wards increased from 173.7 days/month before the change to 213.4 days/month after the change. Nursing hours per patient day data shows no drastic change in manpower (e.g., resignation/training leave) during this period.

Study implications: Rostering is a key process that has an impact on staffing and hence patient outcomes. Changes in the rostering system can affect the rate of the absenteeism of the ward nurses. Future studies can further find out the perception of nurses of the new rostering practice which can be beneficial to improve the work schedule for nurses.

Project Team Members: Ms Fan Peijin Esther Monica (Nursing Division), Ms Fazila Aloweni (Nursing Division), Ms Lim Mei Ling (Nursing Division), Ms Woh Chai Yuen Kelly (Nursing Division), Ms Ang Shin Yuh (Nursing Division).

Project Title: Impact of COVID-19 on Acute Isolation Bed Capacity and Nursing Workforce Requirements: A Retrospective Review

Aims: To understand the impact of COVID-19 on isolation bed capacity requirements, nursing workforce requirements and nurse: patient ratios.

Methods: This was a retrospective review of bed capacity, bed occupancy and nursing workforce data from the isolation units of a tertiary hospital in Singapore from 23rd January 2020 to 31st May 2020. R v4.0.1 and tidyverse 1.3.0 library were used for data cleaning and plotly 4.9.2.1 library for data visualisation.

Results: In the first two months, isolation bed capacity was low (=<203 beds). A sharp increase in bed capacity was seen from 195 beds on 25th March to 487 beds on 29th April 2020, after which it plateaued. Bed occupancy remained lower than bed capacity from January to May 2020. After 16th April 2020, we experienced a shortfall of 1.1 to 70.2 nurses in isolation wards. Due to low occupancy rates, nurse: patient ratio remained acceptable (minimum nurse: patient ratio=0.26).

Study implications: Building a model to predict nursing workforce requirements during pandemic surges may be helpful for planning and ensure adequate staffing.

Project Team Members: Ms Fan Peijin Esther Monica (Nursing Division), Nguyen Ngoc Hoang Long (Health Services Research), Ms Ang Shin Yuh (Nursing Division), Ms Fazila Aloweni (Nursing Division), Ms Goh Hui Qi Ivy (Nursing Division), Ms Quek Li Ting (Nursing Division), A/Prof Tracy Carol Ayre (Nursing Division), Dr Ahmadreza Pourghaderi (Health Services Research), Mr Lam Shao Wei ((Health Services Research), Prof Ong Eng Hock Marcus (Health Services Research & Dept of Emergency Medicine).

Project Title: Memories of Nursing in Singapore-an oral history approach

Aims: To investigate the nurses' rich experiences of nursing practice since the early years from the establishment of the first nursing school in Singapore back in 1956.

Methods: An oral history research approach was adopted to document the rich and detailed accounts of nurses who had trained and practiced in Singapore. Data was collected using semi-structured interviews. Thematic analysis was utilised to analyse the audio interview data.

Results: A total of 54 participants were involved and the interviews lasted approximately 1 to 3 hours, and verbatim transcription of the interviews were conducted concurrently. The participants had a range of 10 to 54 years of nursing experience, with an average of 35 years of experience. The participants spanned a generation over five decades in the nursing profession, with the intention to reflect the different events and experiences that took place in Singapore nursing history. Three themes were identified: resilience in nursing, defining moments and major events in Singapore nursing.

Study implications: This research was essential to capture the accounts of nurses who practiced in the early years of the first Nursing School and transition to Polytechnic as well as experiences of significant milestones and major events that took place in Singapore nursing history. It further provided insight and greater understanding of the unique nursing experience in Singapore.

Project team members: Dr Lim Siew Hoon (Nursing Division SGH), Ms Hassan Norasyikin (Division of Nursing CGH), Ms Lee Kim Hua (Division of Nursing NCC), Ms Teo Lee Wah (Nursing Division NHC), Ms Ngoh Soh Heng Agnes (SingHealth Polyclinic), Ms Chua Ying Jie (Nursing Division KKH), Dr Shorey Shefaly (Alice Lee Centre for Nursing Studies NUS - Yong Loo Lin School of Medicine, Ms Chen Ling-Jun (Nursing Division SKH), Ms Fazila Aloweni (Nursing Division SGH), Ms Ang Shin Yuh (Nursing Division SGH).

Project Title: Evaluation of Infection Prevention and Control Preparedness in acute care nurses: factors influencing adherence to Standard Precautions

Aims: To improve adherence to standard precaution, it is essential to identify factors that affect the use of protective equipment and could increase the risk of occupational exposure to pathogens.

Methods: A descriptive cross-sectional study was conducted where 241 nurses completed the survey including the Factors Influencing Adherence to Standard Precautions Scale (FIASPS) and the Compliance with Standard Precautions Scale (CSPS).

Results: Moderate influence of the judgement (mean = 14.04, SD = 4.04), leadership (M = 14.58, SD 3.78), and culture/practice (M = 12.61, SD = 3.18) factors; high score on contextual cues (M = 15.77, SD = 3.60); and low score on justification (M = 5.76, SD = 4.57). The overall mean CSPS score was 76.68% (SD 13.82). There was a significant negative relationship between justification for non-use of standard precautions and nurses' adherence with standard precautions (r = -0.24, p < 0.001). A significant positive relationship was reported between the leadership factor (r = 0.25, p < 0.001), cultural practice factor in FIASPS (r = 0.24, p < 0.001) and nurse' adherence with standard precautions.

Study implications: Regular training sessions can improve nurses' perception of risks involved with non-adherence. Encouraging nurses to be role models serves to increase the adherence to SPs in their colleagues.

Project Team Members: Nur 'Azzah Bte Suhari (Nursing Division), Dr Stéphane L. Bouchoucha, (School of Nursing and Midwifery Australia, Ms Fazila Aloweni, (Nursing Division), Dr Lim Siew Hoon (Nursing Division).

Project Title: The impact of the work environment, workplace support and individual-related factors on burnout experience of nurses during the COVID-19 pandemic

Aims: To examine the impact of the work environment, workplace support and individual-related factors on burnout during the COVID-19 pandemic.

Methods: This was an analytical cross-sectional study conducted in a hospital in Singapore that nursed *confirmed* and *suspected* COVID-19 patients between 12 March and 25 May 2020. An email invitation was sent to all nurses to participate in an online survey. Multivariable logistic regression analysis was conducted to examine associations between burnout and work environment, workplace support and individual-related factors.

Results: 855 nurses responded to the survey. Compared to nurses working in low-risk areas, nurses in high-risk areas had 1.6 times higher risk of burnout (95% CI: 1.072 – 2.454; *p*=0.022). Perceiving lack of teamwork (OR = 1.630, 95% CI: 1.067– 2.492, *p*=0.024), not feeling appreciated (OR = 14.811, 95% CI: 3.520 – 62.328, *p*<.001) and poor self-rated health (OR=0.348, 95% CI: 0.264-0.460, p<.001) were associated with burnout. Nurses working in high-risk areas, such as wards are designated for acute respiratory infections patients, are at higher risk of experiencing burnout.

Study implications: Nurses in high-risk areas would benefit from interventions that build physical health and *esprit de corps* to prevent burnout.

Project Team Members: Ms Fazila Aloweni (Nursing Division), A/Prof Tracy Carol Ayre (Nursing Division), Melvin Wong (Duke-NUS Medical School), A/Prof Tan Hiang Khoon (Division Surgery & Surgical Oncology), A/Prof Irene Teo (Duke-NUS Medical school).

Care Transformation

STUDY STATUS: IN PROGRESS

Project Title: **Enhancing Post Surgery Recovery with the Use of Telehealth, and AI-assisted wound imaging and assessment**

Aims: To adopt a digital and image-based solution to manage and virtually assess patients with wounds and surgical drain through collaboration with eKare inSight™ 3D wound management system and to evaluate this new solution.

Methods: In Phase 1, collaboration with eKare, a software company specialising in wound imaging, documentation and analytics to co-develop and customise their current wound care app to include surgical drain information such as drainage amount, characteristic of drainage and exit site conditions. A pilot quasi-experimental control study will be done in Phase 2 to assess the effectiveness of the new remote monitoring of the wounds and drain care on surgical patients, and to evaluate their experience and acceptance of telewound care post-surgery.

Study significance: Virtual assessment of wound and drain site can have potential savings in transport costs for patients. Nurses can prioritize their patient care service e.g., patient's wound with signs of infection and ensure time efficiency. The app will allow for the presentation of the wound information in a structured manner and allow remote review by nurses. Daily reporting on the wound images will allow early detection on signs of infection and will be alerted to the clinicians who will follow-up in clinics.

Project Team Members: Ms Chua Siew Huang (Nursing Division), Ms Nagalingam Saraswathi (Nursing Division), Ms Yong Shi Ling Bernice (Nursing Division), Ms Fazila Aloweni, (Nursing Division), Ms Fan Peijin Esther Monica (Nursing Division), Ms Ang Shin Yuh (Nursing Division), A/Prof Chan Chung Yip (Department of HPB & Transplant Surgery, ACP- Surgery), Dr Sue Zann, Dr Ng Yi Zhen (Skin Research   Institute of Singapore), Ms Jessamine Goh (Agency for Science Technology & Research).

Project Title: **Evaluating the Effect of a Bedside Rehabilitation Chair on Functional Decline in Hospitalized Older Adults**

Aims: To create and evaluate the effect of an interactive bedside rehabilitation chair on the functional decline among elderly inpatients.

Methods: A randomised controlled trial will be adopted. Participants will be assigned to either an intervention or control group. Additional to standard care (may or may not include physiotherapy interventions); the intervention group will receive a rehabilitation chair by their bedside and be taught to operate it whereas the controlled group will only receive standard care.

Preliminary results: No significant difference seen in KIADL scores for both groups on admission, p=0.83. However, there was a significant difference in KIADL scores on discharge with better KIADL scores among participants in the intervention group, p=0.004. As for TUG timings, there was a significant reduction in the timings (seconds) for TUG on admission and TUG on discharge within the intervention group (p=0.01) as compared to the control group.

Study implications: The device shows a significant improvement in the functional status of hospitalised older adults. It also shortens the length of stay, aid in reducing inpatient falls and reducing the healthcare costs for both patients and the healthcare organization.

Project team members: Ms Ang Shin Yuh (Nursing Division), A/Prof Kannusamy Premarani (National University of Singapore - Alice Lee Centre for Nursing Studies), Ms Lim Xin Yi Cindy (Nursing Division), Mr Seow Jason Phil (Nursing Division), Ms Fazila Aloweni (Nursing Division), Ms Juweita Binte Arba'in (Nursing Division), A/Prof Ong Hwee Kuan (AHD), Ms Shamala D/O Thilarajah (AHD), A/Prof Tan U-Xuan (Singapore University of Technology and Design - SUTD), A/Prof Yuen Chau (SUTD), Mr Louis Joshua (National University of Singapore - Alice Lee Centre for Nursing Studies).

📚 Caregiver Well-being, Education & Coping

STUDY STATUS: COMPLETED

Project Title: A pilot study on the impact of mindfulness-based intervention on stress and anxiety of caregivers of patients on peritoneal dialysis: a randomised controlled trial

Aims: To examine the feasibility and effectiveness of the mindfulness-based intervention on family caregivers of patients receiving peritoneal dialysis.

Methods: Participating caregivers received either mindfulness training or treatment-as-usual group. Both groups received 4.5-days structured peritoneal dialysis training, but only caregivers in the intervention group received four days of mindfulness training sessions, audio-guided mindfulness practice at home and weekly telephone follow-up. Caregiver's Perceived Stress Scale and State-Trait Anxiety Inventory were evaluated over three-time points. Caregivers were randomly assigned to the intervention (n = 16) and treatment-as-usual (n = 28) group.

Results: Including mindfulness-based intervention as part of the peritoneal dialysis training was feasible but had no effect on perceived stress and anxiety in both groups. There was a trend towards a lower level of perceived stress and anxiety in the intervention group. Baseline scores of both perceived stress and anxiety level were positively correlated with post-intervention scores.

Study implications: PD is a lifelong therapy which can be physically and emotionally demanding for not only the patients themselves but also for the family caregivers who is assisting the patient in managing the PD.

Project Team Members: Ms Fazila Aloweni (Nursing Division), Dr Kinjal Doshi, (Department of Psychology), Ms Nurliyana Agus (Nursing Division), Ms Stephanie Fook (Health Services Research Unit), Ms Sin Yan WU (Nursing Division), Ms Lau Peng KONG (Nursing Division), A/Prof Marjorie Foo (Dept of Renal Medicine), Ms Elena M. Ayob (Nursing Division), Prof Truls Ostbye (Duke-NUS Medical School).
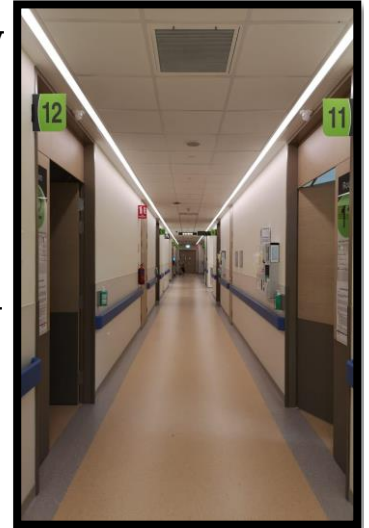
Innovation

STUDY STATUS: IN PROGRESS

Project Title: The Effects of Human-centric lighting on Patients and Nurses

Research has shown the impact of light spectral distribution, illuminance levels, and the timing and duration of light exposure on human vision, health, physiology and behaviour. There is emergent evidence from both fundamental and applied research suggests that dynamic management of lighting system spectral composition, illumination levels, and timing affects patient outcomes and healthcare worker alertness and productivity. Therefore, we aimed to explore the impacts of lighting on the biological response, functional capabilities, and subjective emotional perceptions among patients and nurses in an experimental (with human-centric lighting) and control (with standard lighting) ward. We anticipate that patients will experience a positive impact on their health, recovery and general satisfaction of their hospital stay. For nurses, it could improve work performance and efficiency while reducing errors and improving the overall well-being of the nurse. This could lead to improved patient safety and staff retention rates. Furthermore, we hope the results of this study will aid plans for the new SGH building and may potentially be used to inform the formulation of best practice guidelines for lighting in the healthcare industry.

Project supported by Building and Construction Authority- Green Buildings Innovation Cluster R&D Scheme

Project team members: *Ms Fan Peijin Esther Monica (Nursing Division), Ms Fazila Aloweni (Nursing Division), Prof Chien Szu- Cheng (Engineering, Singapore Institute of Technology), Dr Yeh I-Ling (Health and Social Sciences, Singapore Institute of Technology), Dr Leow Leong Chai (Division of Medicine), Dr Phua Ghee Chee (Division of Medicine), Ms Ang Shin Yuh (Nursing Division).*

STUDY STATUS: COMPLETED

Project Title: Minimising healthcare workers' exposure to COVID-19 patients under airborne isolation through the use of a wearable vital signs monitoring device

There was a need to monitor more patients with less healthcare workers (HCWs) while preserving personal protective equipment (PPE) during the COVID-19 pandemic. Vital signs wearables have been explored as a possible solution to be used. Once attached to the patient, patients' vital signs may be monitored remotely reducing the physical contact with the infected/suspected COVID-19 cases. This study aimed to evaluate the (i) Impact of wearable biosensors on nurse-patient contact time during measurement of vital signs; (ii) Impact of wearable biosensors on PPE usage; and (iii) Patients' and nurses' satisfaction with the use of wearables. A time-motion study was performed in two isolation units to measure the nurse-patient contact time during vital signs measurement. Results reported mean duration of nurse-patient contact time during vital signs measurement was 304.8s/patient (107±1SD) for Ward 67A (no biosensor) and 158.7s/patient (87±1SD) in Ward 88 (with biosensor) (p=0.579). The mean time savings was only 39.2s/patient with the use of wearables. Patients were generally satisfied with the sensor and nurses felt the device and phone had easy application. In conclusion, remote continuous vital signs measurement with a wearable biosensor did not significantly reduce the time spent by nurses in the isolation room for vital signs measurement, however it may reduce PPE usage and appear to be well received by patients and nurses.

Project team members: Ms Fan Peijin Esther Monica (Nursing Division), Dr Chew Si Yuan (Department of Respiratory & CCM), Mr Goh Junyang Ken (Yuan (Department of Respiratory & CCM), Ms Ang Shin Yuh (Nursing Division), Dr Phua Ghee Chee (Division of Medicine).

Project Title: The use of vital signs wearables to detect early deterioration

Lack of timely monitoring of vital signs could result in failure to identify deterioration. Therefore, to overcome this problem, a vital signs wearbles device, incorporated with biosensors were applied to the patient's chest to provides real-time data about the electrophysiological or biochemical status of a patient. We found that out of a total of 178 patients required, seven patients with complete datasets deteriorated during their stay. Among these patients, the biosensor (continuous monitoring) sensing demonstrated NEWS=3 for HR for all seven patients, whereas using spot monitoring (1-2 hourly) data, NEWS=3 for HR was only detected among 2 out of the seven patients. Similarly, with continuous monitoring, NEWS=3 for RR was detected in 6 patients as compared to only 3 with spot monitoring. A satisfaction survey was then performed among the patients and nurses. Majority of the patients (n=43) and nurses (n=23) were satisfied with the biosensors.
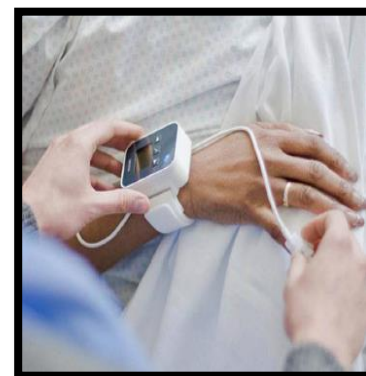
Project team members: Ms Fan Peijin Esther Monica (Nursing Division), Dr Fang Hao Sen Andrew (ACP-Family Medicine), Ms Ang Shin Yuh (Nursing Division), Dr Phua Ghee Chee (Division of Medicine), Ms Anizah Binte Md. Amin (Integrated Health Information Systems), Mr Chan Yong Jie (Integrated Health Information Systems), Mr Wang Yuan Yuan (Integrated Health Information Systems).

Project Title: Smart PPE Vending Machine

The current problem with the traditional PPE holder is not optimal due to potential contamination (exposed to open environment) and frequent topping up. Therefore, leveraging on technology, we decided to trial a vending machine to dispense PPE in DEM@ASC from 1 Aug to 12 Sept 2020. We found that the median frequency on topping up reduced from 4 times to 1. Compared to the traditional PPE holder *versus* the vending machine; the hand hygiene (HH) rate *before taking the PPE* reduced from 69.6% (522/750) to 29.1% (166/571). The increase in HH rate may be due to the educational video on HH that was played on the screen and the reminder to hand rub before taking the items from the collection bin. Although there was a decrease in the median times that nurses have to top up the PPE, nurses still do prefer taking the PPE from the traditional PPE holder as it is faster. Qualitative feedback from the nurses was to make the restocking of PPE simpler and to reduce the dispensing time from 20 to 10 sec. The vending machine may also not be suitable during an emergency as the nurses cannot "just grab & go".

Project supported by SGH COVID-19 Resilience Innovation Grant

Project members: Ms Fazila Aloweni (Nursing Division), Ms Tan Kwee Yuen (Nursing Division), Ms Masziahton Binti Mohamed Masodi (Nursing Division), Ms Nur Farhanna Binte Murat (Nursing Division), Ms Pearl Gloria Nithiya D/O Vijaya Kumar (Nursing Division), Ms Thu Thu Hnin San (Nursing Division), Dr Kwa Lay Hoon Andrea (AHD).

Evidence-Based Nursing

Clinical Query 1: What are the recommendations frequencies and the types of blood investigation required after the treatment of hyperkalaemia?

Focus: Hyperglycaemia and/or hypoglycaemic effect

Results & Recommendations:
Blood glucose and other monitoring such as potassium level, ECG and urine output are recommended after the treatment of hyperkalemia. Special precaution must be taken for patients with chronic kidney disease and patients with no prior history of DM (greater insulin insensitivity). It is recommended to check capillary blood **glucose immediately after administration** of hyperkalemia kit and then **after 15 and 30 minutes and then every hour up to 6 hours.** Or close monitoring of blood glucose for a least 3 hours. Hypoglycemia is a recognised complication of this treatment, whereas hyperglycemia from glucose infusions can drive potassium out of the intracellular space, leading to hyperkalemia. Therefore, nurses have to be cautious and monitor blood glucose level as per recommendation.

Risk factors of hypoglycemia-related to hyperkalemia treatment:

- Non-diabetic status (no diabetes history and no diabetic medication)
- Low body weight
- Older age >60years old
- Low pre-treatment blood glucose
- Patients with renal impartment (AKI, CKD, ESRD)

Clinical Query 2: Is there a need for a dedicated IV cannula when administering IV contrast before any radiological investigations?

Focus: Dedicated IV cannula for administration of IV contrast and related complications

Results & Recommendations: There was no mention the need for a dedicated IV cannula to administer IV contrast. Although a review is done by Heshmatzadeh et a. (2018) reported that the **rate of extravasation is higher in use of an existing cannula instead of starting a new IV line**. Nevertheless, careful consideration and precautions are needed when patients are presented with any of the risks factors as summarised below.

Recommended guidelines for contrast injection include:

- (i)   use a peripheral cannula that is ≥20 gauge.
- (ii) placement of cannula should be in a large arm vein or at the antecubital site.
- (iii) evaluate the status of the access through the aspiration to determine blood return, followed by saline flush; and
- (iv) failure to achieve blood return or resistance on flushing is an indication for choosing an alternative contrast injection site or ensure site monitoring during contrast injection.
- (v)   peripheral vascular access device site be changed within 24 hours of injection of a second vesicant (contrast media, fluid support, IV push medications, or antibiotics)

Risk factors of extravasation related to contrast media:

- Female gender
- Children
- Low conscious level
- Older age >60years old
- Patients with difficult in IV access, frequent vein punctures, history of radiation therapy in the concerned area, chemotherapy, little muscle mass, and atrophy of subcutaneous tissue
- Patients with lymphedema, limb swelling, arterial or venous insufficiency to the affected limb
- Patients in general wards or ICUs
- Use of an existing cannula inserted prior to arrival at the radiology department
- Faster infusion rate
- Venous access at the dorsum of the hand/ deep brachial IV catheter sites
- Longer catheter dwell time
- Use of power injection
- Higher contrast media viscosity

Risk factors of phlebitis related to contrast media:

- 24–48 hours of injection of contrast and same site use for injection of another vesicant

Clinical Query 3: What are the recommended methods of serving oral cytotoxic medication which cannot be crush or cut for patients with NG tube?

Focus: Oral cytotoxic drugs via NGT and related safety measures

Results & Recommendations:
All oral tablet chemo-drugs that are dispensed and administered within the hospital should be prepared by a pharmacist, including the crushing, or splitting of tablets or capsules. If the tablets must be split or crushed, this must be done in a dedicated workspace with an adequate controlled vent system. Personal protective equipment (e.g., double gloves, mask, gown) must be worn, and the workspace must be thoroughly cleaned immediately afterwards. Tablets may be crushed using a crushing syringe (preferred) or inside double layers of sealed zip lock bags, to avoid powder in the workspace air.

All oral chemotherapy drugs are to be labelled with instructions indicating if the drug can be crushed, pharmacists are to advice on alternative dose formulation if the crushing of drug would increase risks and alter drug bioavailability. A closed system is preferred for crushing cytotoxic medication, as it avoids environment contamination and exposure of nurses to the hazardous particles. A proper administration of drug via enteral feeding includes dilution/flushes using sterile or purified water to tap water before and after the administration to ensure the total dose is administered. Medication should not be mix with feeding formula and other chemotherapy drugs; this will result in drug interactions and tube occlusion. ENfit syringes are recommended as they are designed specifically for enteral processes.

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Get in Touch With Us

Address: SingHealth Tower Level 15, 10 Hospital Boulevard, Singapore 168582

Email: nursing.research @sgh.com.sg   **Contact no**: 6576 2590

DDN Ang Shin Yuh	NC Esther Monica Fan	CRC Raden Nurheryany
SNM Fazila Aloweni	NC Nanthakumahrie	CRC Lee Jia Hui
ANC Lim Siew Hoon (Dr)		SACRC Nurliyana Bte Agus