CHAPTER 12

NURSING SENSITIVE OUTCOMES INDICATORS (NSOIs)

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Focusing on improving care in the intensive care unit (ICU) is an acknowledged priority area for critical care nurses internationally. This chapter addresses prevention of adverse events in the ICU including patient falls, displacement of tubes (endotracheal/tracheostomy) line and drains, and medication errors as well as patient and family satisfaction . Collectively, these nursing sensitive outcome indicators are global areas of focus for critical care nurses. Exemplars are provided to highlight the important role that critical care nurses play in improving quality of care in the ICU by using nursing sensitive outcome indicators.

LEARNING OUTCOMES After completing this e-chapter you will be able to:

1) Identify the characteristics of Nursing Sensitive Outcomes Indicators;
2) Review the definitions of fall, displacement of tubes/lines/drains and medication incidents;
3) Understand the risk factors of falls in intensive care;
4) Highlight strategies of fall prevention;
5) Discuss recommendations for minimizing the chance of displacement of tube/line/drains;
6) Explain the types and causes of medication errors in intensive care unit;

7) Discuss strategies for improving medication safety;

8) Identify evidence-based interventions that are effective in enhancing patient and family satisfaction

9) Discuss the role of the nurse in promoting improved care in the ICU using nursing sensitive outcome indicators

OVERVIEW

The dawn of the twenty-first century marks a new era for the entire nursing profession. To keep pace with the ageing population; advanced technology; rising public expectation; escalating healthcare costs; and the advent of modern medicine; coupled with the need to achieve improvement in healthcare quality and safety, clinical nurses, and nurse executives are increasingly concerned about measuring the outcomes of care in their workplace and gathering evidence to justify their decisions for resources allocation. The growing sophistication of the health care systems everywhere calls for an increased emphasis on evidence and outcomes. Gallagher & Rowell (2003) opined that "The provision of outcome-oriented, cost-effective health care is no longer a goal. It is a mandate. To accomplish this mandate, the relationship between the costs, quality and desired outcomes of care, and the processes involved in providing care must be reexamined." Successful indicators that capture nursing-sensitive patient outcomes tie together research findings and best practices in an effort to create better patient care.

What are Nursing Sensitive Outcome/Quality Indicators?

The American Nurses Association (1996) defined Nursing-sensitive Quality Indicators as those indicators that capture care or are most affected by nursing care**.** The use of **nurse sensitive quality indicators** in Intensive Care Units (ICU) has been as a tool to show the clear linkages between nursing interventions, staffing levels, and positive patient outcomes. Nursing Sensitive Quality Indicators (NSQIs) and Nursing Sensitive Outcomes Indicators

(NSOIs) are referring to the same thing - patient outcomes that are directly or indirectly influenced by nursing (Dorman, 1977).

In 1998, American Nurses Association (ANA) funded the development of a National Database named as the National Database of Nursing Quality Indicators (NDNQI). Its goals are to promote and facilitate the standardization of information submitted by hospitals across the United States on nursing quality and patient outcomes. Yang et al. (1999) defined NSOI as "…changes in health status upon which nursing care has had a direct influence". The International Council of Nurses (ICN 2001) stated it as "… the measure or status of a nursing diagnosis at points in time after a nursing intervention. Nursing-sensitive indicators are specific to nursing and differ from medical indicators of care quality. As such, nursing outcomes indicators are those outcomes most influenced by nursing care" (Montalvo, 2007).

NDNQI began formally collecting data related to ten NSQIs for Acute Care Settings include:

1. Total Nursing Care Hours provided per patient day
2. Mix of RNs, LPNs & unlicensed staff caring for patients in Acute Care Settings
3. Pressure Ulcers
4. Nursing Staff Satisfaction
5. Nosocomial Infection Rate (bacteremia's associated with central lines)
6. Patient Falls
7. Patient Satisfaction with Overall Care
8. Patient Satisfaction with Educational Information

9. Patient Satisfaction with Pain Management

10. Patient Satisfaction with Nursing Care

(Nursing Administration Quarterly 2003 & Nursing World, ANA Indicator History 2015)

The recommended definitions of the ten indicators can be found in ANA's 2015 publication. In this chapter fall displacement of tubes/lines/drains, medication incidents and patient/family satisfaction and related indicators will be discussed as it relates to critical care nursing.

The Joint Commission started incorporating NSOIs into its standards for accreditation. Nowadays, nursing-sensitive indicators are widely used.

As an example of how NSOI can be used to monitor nursing impact, data collection for NSOIs in ICUs started in 2005 in Hong Kong. Currently fifteen ICUs in public hospitals (at Level II and above) in Hong Kong contribute to this database.

Hong Kong established a set of Specialty Guidelines for ICU nurses in which service indicators were listed as follows:

Patient-focused Outcomes Indicators listed in the Specialty (ICU) Guidelines:

<u>Treatment/Care Modality Indicators:</u>

Adverse Incident rates such as medication incident rate, patient fall rate and displacement of tubes / Complications such as pressure ulcer/Injury rate and nosocomial infection rate / Number of resuscitation episode versus successful resuscitation rate

<u>Psychosocial Indicators</u>

Knowledge level / Satisfaction level /Number of complaints /Number of appreciations

General Indicators

Mortality rate / Length of stay / Unplanned readmission rate

Tracking of the above-mentioned psychosocial indicators and general indicators has been conducted at the hospital level. Data collection has focused on seven NSOIs which are grouped under three categories:

1) Adverse Incidents II) Complications III) Patient and patient's family satisfaction

I. Adverse Incidents:

1) Patient Falls 2) Displacement of tubes, lines and drains 3) Medication Error

II. Complications:

1) Pressure Ulcer/Injury 2) Nosocomial Infection (covered elsewhere in Chapter XX - Vollman)

III. Satisfaction: Patient and patient's family satisfaction on the quality of care received

We revisited the term "Nursing Sensitive Outcomes Indicators (NSOIs)"; studied the topic in depth; confirmed and defined the indicators to be reported; devised NSOI formulas for calculating rates; devised reporting forms to capture data; designed Training Need Analysis Tool and refined questionnaire for satisfaction survey (patient and family). Since early 2005, data on four NSOIs 1) Patient Falls, 2) Displacement of tubes, lines and drains, 3) Medication Errors and 4) Pressure Ulcer were captured in ICUs (at departmental/unit level) & reported on a six monthly basis. We aimed at capturing quality data for performance improvement and for presenting as a profile of ICU quality in the form of NSOIs because data collected can be used to compare among ICUs and to trend over time. Hospital acquired infection (nosocomial infection) data were collected by Infection Control Unit and

satisfaction survey (patient / patient's family) satisfaction surveys were conducted at the hospital level.

Hence, an inventory of patient outcomes related to the scope of ICU nursing practice confirmed and data were collected at departmental level of all the public hospitals. Examples from this initiative are provided throughout this chapter to highlight the role of the critical care nurse in improving patient care in the ICU.

ACUTE CARE PATIENT FALL

NSOI DEFINITIONS & MEASUREMENTS

I. Adverse Incident

1 Acute Care Patient Fall

Definition:

The World Health Organization (2012) describes "Fall" as any unintentional event in which a person comes to rest on the floor. Lianne Jeffs et. al. (2005) defined acute care patient fall as the rate per 1000 patient days at which patients experience an unplanned descent to the floor during the course of ICU stay. All falls (accidental fall, unanticipated physiologic fall, and anticipated physiologic fall) should be reported and described by level of injury or no injury.

The measure for the rate per 1,000 bed days occupied at which patients experience unplanned descent to the floor during the course of their hospital stays would be computed as:

- **Numerator Statement**: Total number of patients falls leading to injury or no injury x1000
- **Denominator Statement**: Total number of patient days during the period (Total number of Bed Days Occupied)

CATEGORIZATION OF FALLS

A patient fall is one of the major clinical risks in the health care setting. Patient falls have been recognized as a significant adverse event in hospitals. Falls can be categorized into 3 groups:

1. **Accidental fall** is caused by environmental or extrinsic hazards that could result in a trip or slip, which can be prevented by ensuring environmental safety.
2. **Anticipated physiologic fall** is associated with intrinsic factors such as aging, altered mental state, unsteady gait and sensory deficits, which can be prevented by specific interventions after assessment.
3. **Unanticipated physiologic fall** is attributed to unexpected physiologic events including fainting, orthostatic hypotension, seizures or the use of sedatives and hypnotics. Although this type of fall cannot be predicted before the first occurrence, subsequent fall is preventable (Morse, 2008). Therefore, patient fall is not an inevitable event; it can be prevented when appropriate prevention strategies are implemented.

In the hospital setting, a patient fall and fall-related injuries are associated with negative consequences on patients, relatives, as well as healthcare providers. Beyond physical injuries, patients may experience anxiety, loss of confidence and depression. Fall related physical

injuries can lead to the escalation of hospital cost. The costs may be due to extra diagnostic test, treatment for injuries, rehabilitation, and extension of the length of hospitalization (Flanders et. al., 2009). Relatives may be anxious, leading to increased complaints and potential litigation. On the other hand, healthcare providers may also suffer from guilty feeling and shame on the failure of care (Patman et. al. 2011). Thus, patient falls must be addressed as one of the quality-safety indicators for healthcare institutions, and the ICU.

DATA REPORTING

Web-based electronic system can be employed to facilitate the timely reporting, analysis and recommendation. The following information can be included in the fall incident report:

1. Patient information, such as date of admission, diagnosis, and premorbid condition, such as conscious level and mobility.
2. Brief description of patient's action during fall and the reason behind, such as patient's cognitive and judgment problem, underlying medical condition, and patient's condition before fall was underestimated.
3. Immediate consequence such as pain, superficial injury & fracture.
4. Patient's condition after fall (nurse's assessment and observation).
5. Immediate management such as blood pressure checking, radiological investigation, dressing and inform relatives.

A set of comprehensive fall incident data are essential for conducting an effective root-cause-analysis (RCA).

POTENTIAL FALL RISKS IN INTENSIVE CARE UNITS

The etiology of a fall is multi-factorial. Commonly identified risk factors for in-hospital patient falls include:

1. Intrinsic Factors:

- Age (extremes of age: 1-5 or > 65 years of age)
- Falls history
- Syncope syndrome
- Continence problems
- Cognitive impairment
- Postural instability, mobility problems and / or balance problems
- Sensory impairment
- Medication such as cardiovascular drugs, drugs used in central nervous system, or poly-pharmacy
- Communication problems
- Health problems that may increase their risk of fall

2. Extrinsic Factors:

- Slippery floor
- Inadequate lighting
- Inappropriate height of beds and chairs
- Trailing electric cords
- Not fitting slippers

(Source: Hong Kong East Cluster, Hospital Authority, Hong Kong: Quality and Safety Office, 2014 & Queen Mary Hospital: Patient Safety Subcommittee, 2012)

However, the etiologies of fall in critically ill patients are specific. The intrinsic factors of the falls in ICU include de-conditioning of patients, which can occur rapidly after ICU admission. Extrinsic factors are related to the fall, which are less with slippery floor or lighting but more with the amount of tubes, cables, or drainage bags attached to patients. The equipment hinders patient's mobility as well as increases their risk of falls. The uniqueness of fall risk factors in the ICU generates unique preventive measures (Patman et. al., 2011).

CASES SHARING WITH LEARNING POINTS

One fall incident happened in Tuen Mun Hospital when patient was sat out in chair with no railing and there existed just a mobile bedside table nearby. The patient felt tired, and attempted to return to bed by himself without notifying nurses. With unsteady gait, he eventually fell on the floor. After this incident, a **"sit out checklist"** was developed to ensure that safety measures had been taken before we sat the patient out of bed (Appendix 1).

Furthermore, fall incidents usually happened during meal time or during the time when nursing manpower is thin (duty staffs are overloaded with work or being occupied by other patients). Sometimes, inattention or less vigilance of staffs is a risk factor for falls in ICUs. Hence, having **safety rounds** by designated patrol nurses at regular intervals and during peak hours is highly recommended.

According to the sharing among NSOI sub-committee members, certain brands of split type side rails had been identified as a potential risk item. They did not cover the full length of the bed; patient could easily get out of bed by moving to the end of it. It was proven by one reported incident. NSOI subcommittee members were advised not to purchase that brand of side rails. Nurse executives were recommended to pay more attention to the **choice of bed** in the future.

Moreover, NSOI subcommittee members also identified that a negative pressure isolation room had the potential risk for fall. **Isolation rooms** provided a physical barrier and delayed nursing actions. If a nurse noted a dangerous action of patient inside the room, she/he might not be able to approach the patient in time. The need for putting personal protective equipment on before entering the isolation room delayed nurses' responses. Although no fall incidents inside the isolation room was reported, the risk of fall would be anticipated. Critical care nurses should be on the alert for this potential risk and perform frequent patient rounds when patents are being cared for in the isolation rooms. Overall, critical care nurses are required to identify the unique risk factors for each individual patient and implement timely interventions whenever necessary.

FALL PREVENTION STRATEGIES

To prevent falls, an integrated multi-factorial approach is recommended as follows:

1. Identify high risk patient through assessment
2. Implement interventions to minimize risk of falls
3. Monitor the fall rates

4. Provide education

The Morse Fall Scale (MFS) is an individualized criterion-referenced assessment tool which is designed for measuring the likelihood of adult patient falls in hospitals. There are a few assessment tools available which are specific to ICUs' setting e.g. St. Thomas's Risk Assessment Tool in Falling Elderly in Patients (STRATIFY); Downton fall risk tool; Tullamore tool; and Tinetti fall risk index. Most ICUs in Hong Kong adopt **"MFS"** as their fall risk assessment tool. It consists of six variables that are quick and easy to be scored, namely 1) history of falling, 2) secondary diagnosis, 3) the use of ambulatory aids, 4) intravenous therapy/intravenous assessment, 5) gait condition, and 6) mental status. Each variable is scored from 0 to 30 marks. If the score is less than 45 marks, the risk level will be defined as "not at risk". If the score is equal to 45 marks or more, the risk level will be defined as "high". Risk assessment should be done on admission, then to be repeated on regular interval and whenever condition warrants (i.e. change of health status or after a fall incident). In fact, most of the ICU patient scores are high when using "MFS". The sensitivity of the tool to differentiate the high risk group patients may not be absolutely adequate in critical care setting, so clinical observation and clinical judgment are indispensable in assessing fall risks of ICU patients. Developing new fall risk assessment tool on the uniqueness of critically ill patients should be considered by the critical care nurse to meet their patient care needs as indicated (Flanders et. al., 2009).

INTERVENTIONS (UNIVERSAL OR SPECIFIC) TO MINIMIZE FALL RISKS

Two levels of preventive measures could be implemented to target fall prevention. Universal fall prevention interventions should be offered to all patients. In addition, specific interventions for high risk groups after professional judgment should be implemented.

1. ***Universal fall prevention interventions include***:
   - Orientate patient to ICU environment and routines
   - Provide call bell in reach and educate the using of call bell system
   - Respond to patient's call as soon as possible
   - Keep the necessary items / frequently used belongings within reach of patient
   - Stabilize the bed, sit out chair and bed rail with brakes locked etc.
   - Ensure the patient's clothing and footwear are properly fitted when assist the patient to walk about, e.g. roll up the pants to prevent tripping.
   - Advice patient to put on appropriate spectacle or hearing aid to improve communication
   - Provide pamphlet on falls prevention to patient and relative
2. ***Specific Interventions for high risk group include:***
   - Make fall risks as part of nurse-to-nurse report (both at shift change and meal break).
   - Display fall hazard signage on patient's head of bed for better communication between all healthcare providers
   - Relocate agitated patients to easy-observable bed

- Provide constant inspection / ward round by patrol during peak hour such as meal time and admission of emergency cases
- Provide regular assistance for toileting to patients as required
- Educate the patient about his/her risks to fall periodically
- Inform relatives that the patient is at high falls risk
- Manage delirium & postural hypotension
- Optimize falls related medication such as psychoactive and cardiovascular drugs
- Use restraints as last resort and review periodically
- Address identified falls risk to general ward staff when discharge from ICU

(Source: Kowloon Central Cluster, Hospital Authority, Hong Kong: Task Group on Patient Falls, 2014; Hong Kong East Cluster: Quality & Safety Office, 2014; New Territories West Cluster: Clinical Service/Chairperson of Cluster Clinical Governance Committee, 2014; Queen Mary Hospital: Patient Safety Subcommittee, 2010)

Physical restraints

Physical restraints should be used as a last resort since it can be both humiliating and harmful. Critical care nurses should follow hospital guidelines on applying physical restraints on patients and providing appropriate observation and care to the restrained patients.

The value of applying physical restraints in ICU should be evaluated regularly. As an example, in 2012, Tuen Mun Hospital ICU implemented a quality improvement program on “Application of Physical Restraints”. The aims of this program were to minimize the inappropriate use of physical restraint, and ensure patients’ dignity and safety. A scoring tool was established to provide an objective guide for nurses when applying physical restraint. The scoring tool included patient’s behavior and muscle power, the types of medical devices/

equipment that the patient had as well as special considerations. Patients are categorized under three color zone according to the total score – Red, Yellow and Green. Red zone – restraint should be considered as necessary for the best interest of patients; Yellow zone - decision of using physical restraint is subjected to nurses' judgment; and Green zone – restraint should not be applied (Appendix 2). Electronic calculation of restraint score has been installed in the Clinical Information System of the hospital to facilitate the implementation. Signage is hung on each bed as a reminder. A clinical audit on the use of the scoring tool was conducted from September 2012 to December 2012. Compliance rates of using the scoring tool and inappropriateness of using restraint were evaluated.

A total of 555 ICU patient episodes were involved in the evaluation. The compliance rate of using the scoring tool was 80%. Approximately, 40% of patients were physically restrained at the time of audit; the prevalence rate was similar to the background rate which was 35% according to the prevalence study. Inappropriateness was much improved, decreasing from 12% to 5% of patient episodes after the project was implemented. A total of 40% of patient episodes were not restrained as they were categorized under the Yellow zone. The objective scoring system was considered useful to minimize the inappropriate use of physical restraint in ICUs, and it provided autonomy for nurses to make restraint decision. Validation of this scoring system would be considered in our next step of ward improvement action.

As a result of the initiative, the ICU will take the initiative to start a quality improvement project on "Reduction of Physical Restrainer Rate". The project will be led by nurse

consultants. Subsequent to data collection, analysis and benchmarking will also be performed. We hope that this project could improve appropriate use of physical restraints in the ICU.

FALL RATE MONITORING AND STAFF EDUCATION

Ward managers are delegated to report, monitor, analyze the trends, and review the preventive measures periodically (Queen Mary Hospital: Patient Safety Subcommittee, 2010). Education on falls prevention and management are provided for new staff. It should be included in the preceptorship program and refresher program. All staff should be trained with skills to depict reversible risk factors, identify potential fallers and implement appropriate interventions. In addition, attractive data display boards are recommended to increase staffs' awareness. Fall debriefings should be conducted after each fall incident. It is non-punitive, and it is a chance for learning and improvement (New Territories West Cluster: Clinical Service/Chairperson of Cluster Clinical Governance Committee, 2014). Staff engagement in fall investigation and sharing the recommendations with staff are successful elements on fall prevention management.

APPENDIX 1: Tuen Mun Hospital ICU Checklist for Sitting Patient Out of Bed

HOSPITAL AUTHORITY TUEN MUN HOSPITAL ICU CHECKLIST FOR SIT OUT	ADDRESSOGRAPH

* Please read before and sign after the sit out procedure by case in-charge nurse.

Yes =√, No= X, NA= Not Applicable

No.	Behaviors	Yes/No/NA	Remarks
1.	Assess patient general condition whether he/she is fit for sit out with agreement of physician.		
2.	Adjust bed in the lower position and brakes locked, so that it is safer for the patient to sit on and sit out of bed.		
3.	Educate the patient to move slowly from a lying to a sitting or standing position to minimize dizziness and falls due to postural hypotension.		
4.	Provide appropriate and adequate assistance for transfer.		
5.	Accommodate the patient near the bed and within eye reach of nurses for more easy observation and detection of risk.		
6.	Ensure the wheels of sit out chair are locked.		
7.	Ensure all IV lines, drains & catheters in proper position and secure well.		
8.	Educate the patient to stay in chair until helper arrives.		
9.	Observe the patient vital sign and stay with the patient until condition stable.		
10.	Reinforce calling for assistance.		
11.	Arrange patient's belongings and call bell within reach.		
12	Provide scope for divisional activities.		
13.	Re-orientate patient frequently.		
14.	Educate patient not to climb out of chair or ambulate alone.		
15.	Respond to patient's need promptly.		
16.	Invite relatives to stay with the patient if needed, especially for dementia and confused patient.		
17.	Apply safety vests and/or limb holder if necessary.		
	For safety vest and/ or limb holder(s) applied:		
18.	Ensure the safety vest and/or limb holders in proper position and functioning well.		
19.	Explain the need of restraint to patient and gain his/her co-operation.		
20.	Perform close observation for patient after apply restraint equipment & document promptly.		
21.	Inform physician the reasons of restraint.		
22	Inform relatives/significant others as soon as possible.		

Name of nurse:_____ Signature:_____ Date:_____ Time:_____

APPENDIX 2: The Grading and Scoring System for Applying Restraint in ICU, Tuen Mun Hospital, Hong Kong

The Grading and Scoring System for Applying Restraint

Code Green (not suggest to apply restraint)
When: Score <8

Code Yellow (subject to nurse's decision, apply restraint for the best interest of patient care)
When: Score between 8-16

Suggested action:

1. Physical restraint suggested
   Score 8-12 try mitten (with rod/without rod) +/-safety vest
   Score 13-16 try limb holder + mitten (with rod/without rod) +/-safety vest

2. Exclude reversible cause
   a Foley obstruction
   b Bowel opening
   c Check GEM for Na, O2, CO2 & H'stix
   d Pain assessment
   e Inform MO if needed

3. Consider to use communication board

4. Consider to off restraint intermittently if condition feasible

Code Red (Strongly suggest to apply restraint until MO/AC assessment)
When Score>16

Suggested action
Limb holder mitten+/-safety vest
Exclude reversible cause similar as above

A. Behavioral level

1. Unconscious/semiconscious +0
2. Alert and calm +0
3. Restless or agitated +4
4. Combative +8
5. Currently or previously try to remove devices +8

B. Life Sustaining Device

1. Mechanical ventilation/BIPAP +2
2. Tracheostomy tube +1
3. Central line/ A-line / peripheral IV assess +1
4. Chest/pigtail/surgical drain/IABP/IV pacing +2
5. ICP +2
6. Supra-pubic catheter +2
7. CVVH/Dialysis +2

C. Muscle Power level

1. No or only visible sign of muscle contraction only +0
2. Insufficient muscle power to overcome gravity +2
3. Sufficient muscle power to overcome gravity +4
4. Full muscle power +6

D. Other Conditions

1. In Isolation room. +8
2. Difficult Airway. +8
3. When sedation withhold for conscious state assessment or extubation. +8

Prepared by Dr H M Lee
Version VI Date: 12 July 2012

Displacement of tubes (Endotracheal/Tracheostomy, i.e. Unintended extubation), lines and drains

Definition

An unintended incident during which the appropriate marking on the tube inserted is found to be different from the previous observation or previous record, and the primary function of the tube cannot be achieved.

The measure for the rate per 1,000 bed days occupied would be computed as:

- **Numerator Statement:** Total number of confirmed unintentional displacement of tubes/lines/drains x1000
- **Denominator Statement**: Total number of patient days (Bed Days Occupied) within the period

Country Specific Exemplar Focusing on Decreasing Displacement of tubes (Endotracheal/Tracheostomy, i.e. Unintended extubation), lines and drains.

The majority of the ICUs in Hong Kong are within the public sector. There exists an electronic self-reporting system for reporting incidents in all public hospitals in Hong Kong. In view of the uniqueness of each ICU, the incident rate may not truly reflect the performance of individual hospitals. However, the result thus generated from **13 Adult ICUs** still can serve as a reference when we compare the trend of performance of individual hospital and the aggregated numbers of all hospitals. Basing on the analysis, contributing factors and correlating factors are mapped out and comments and recommendations are summarized for quality improvement purposes.

CONTENT OF THE REPORTING FORM

The self-reporting form (Appendix 1) includes patient's personal particulars; date and time of incident; personnel involved regarding the displacement; description of incident; details about the displaced tube/line/drain; factors contributing to incident; patient outcome; and evaluation.

Background information of the incident includes incident occurred during shift handover or meal break, and/or when patient undergoing nursing procedures like bed bathing, position turning, ambulatory activities, admission and discharge activities, or transportation, medical procedures or other procedures, or when case nurse being occupied by care of another patient, preparation of works or ward round. Patient factors include whether the patient received sedation, was restless, any communication problems, being physically restrained (secured or loosen), and level of cooperation.

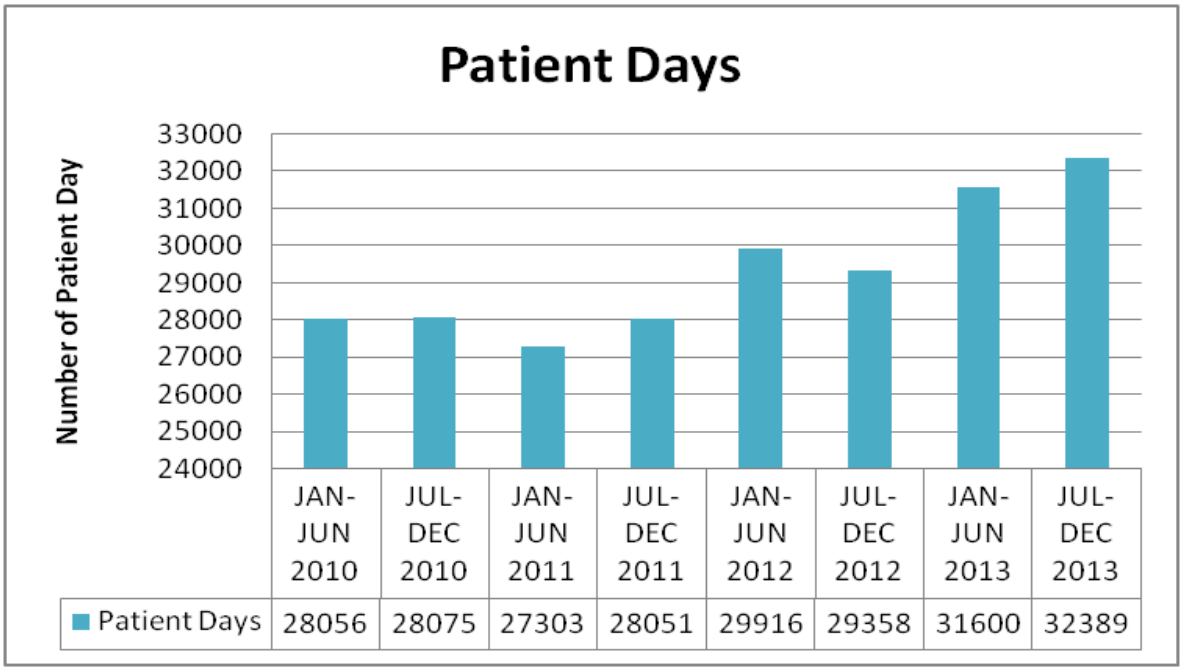
The report also includes system and human factors that contribute to the incident. For the system factors, the nurse could select one or more items including poor design or maintenance of device, poor quality of material, poorly secured tube/drain/line, high activity level, below normal staff and patient ratio, inadequate staff training, and inconvenient patient location including those in the side or isolation room. For the human factors, the nurse could choose inadequate patient assessment, incompetent in or unfamiliar with unit protocol or guidelines, distraction, or inattention.

The patient outcome also needs to be reported if the displaced tube/line/drain will require reinsertion and/or re-intubation within 24 hours.

The case nurse also evaluates whether the incident is avoidable or unavoidable and recommends any improvement initiatives to avoid the incident happening again. The self-report is reviewed by a shift in-charge or senior nurse to check whether the input data are accurate or not.

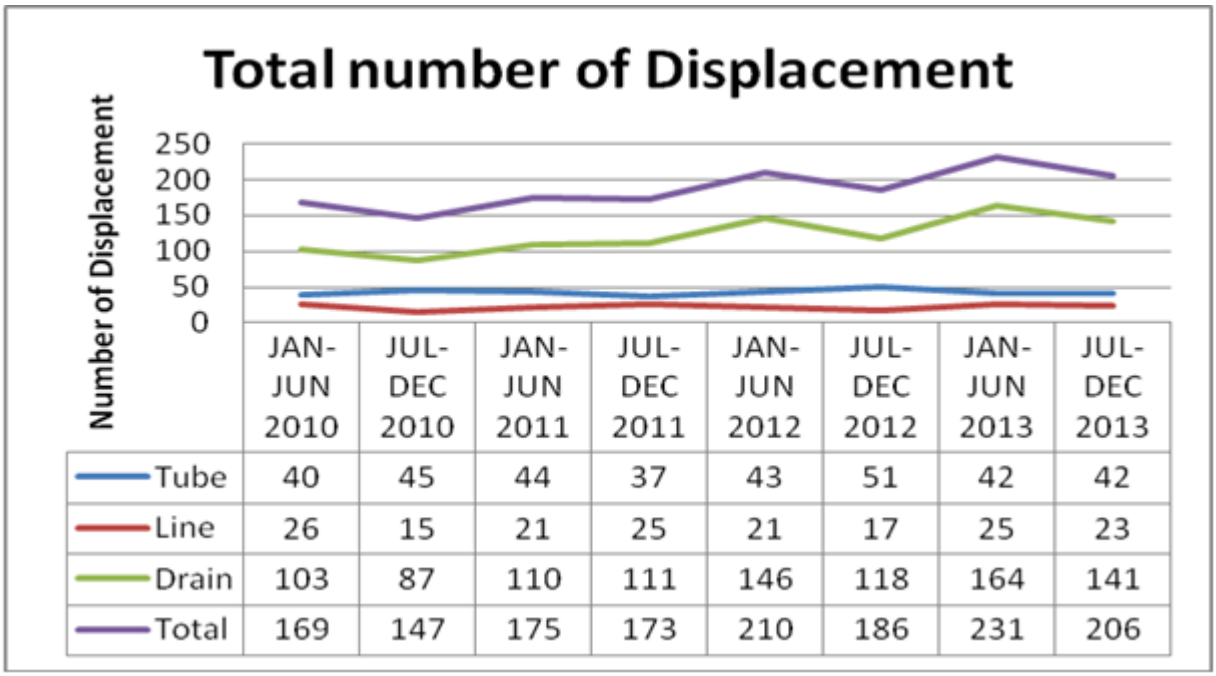
SUMMARY OF DATA

Data were collected from 13 hospitals and analyzed for the period from January 2010 through December 2013.



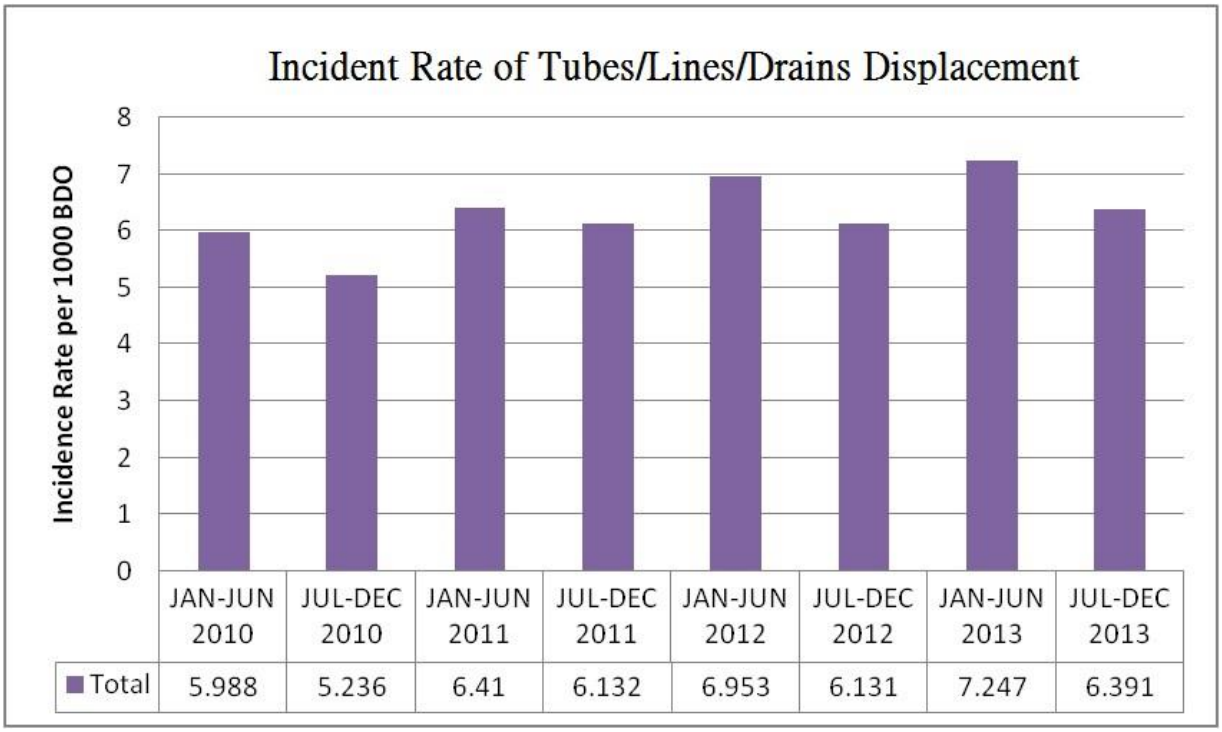
	JAN-JUN 2010	JUL-DEC 2010	JAN-JUN 2011	JUL-DEC 2011	JAN-JUN 2012	JUL-DEC 2012	JAN-JUN 2013	JUL-DEC 2013
Patient Days	28056	28075	27303	28051	29916	29358	31600	32389

Table 1: Patient days across all the 13 Adult ICUs



	JAN-JUN 2010	JUL-DEC 2010	JAN-JUN 2011	JUL-DEC 2011	JAN-JUN 2012	JUL-DEC 2012	JAN-JUN 2013	JUL-DEC 2013
Tube	40	45	44	37	43	51	42	42
Line	26	15	21	25	21	17	25	23
Drain	103	87	110	111	146	118	164	141
Total	169	147	175	173	210	186	231	206

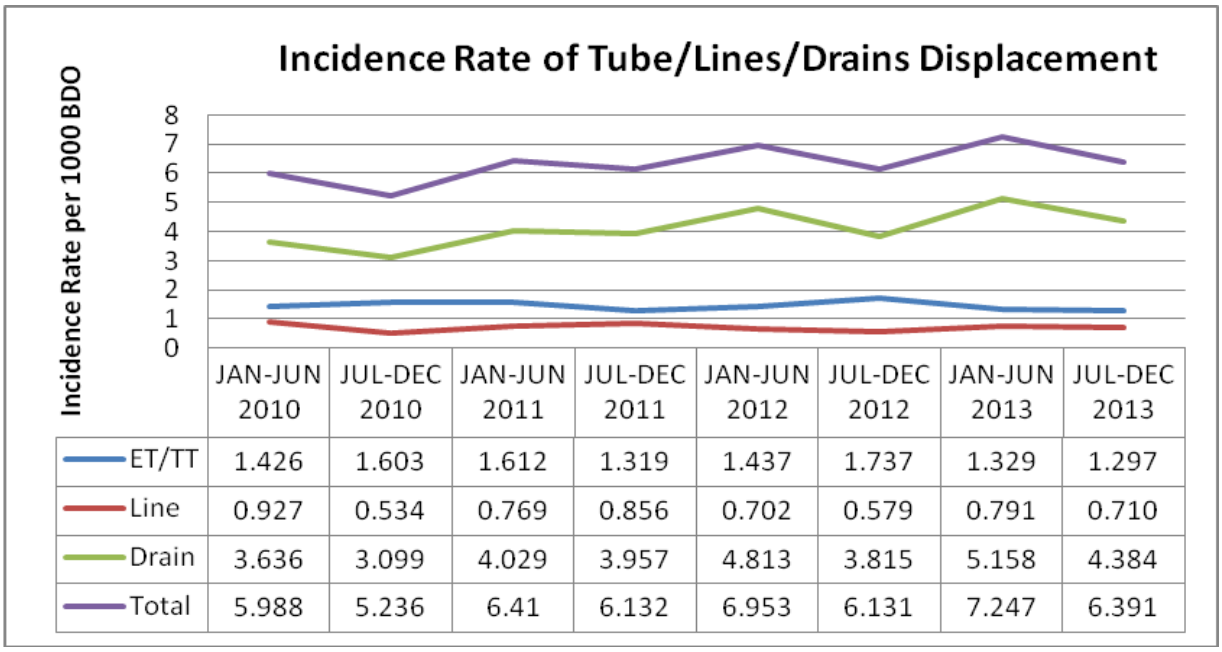
Table 2: Number of dsiplacements across all the 13 Adult ICUs



	JAN-JUN 2010	JUL-DEC 2010	JAN-JUN 2011	JUL-DEC 2011	JAN-JUN 2012	JUL-DEC 2012	JAN-JUN 2013	JUL-DEC 2013
Total	5.988	5.236	6.41	6.132	6.953	6.131	7.247	6.391

Table 3: Displacements per 1000 bed days across all the 13 Adult ICUs

The overall patient days (PD) increased from 28,075 (2010) to 32,389 (2013) (Table 1). The total number of displacement slightly increased from 169 to 206 incidents (Table 2). The total displacement incidents also slightly increased from 5.988 in the first half year of 2010 (Table 3). to 6.391. Compared 27303 (PD) in January - June 2011 with 32389 (PD) in July - December 2013, the incident rate of displacement was slightly decreased from 6.41 to 6.391, in contrast with the (PD), there was an increase of 13.3%.



	JAN-JUN 2010	JUL-DEC 2010	JAN-JUN 2011	JUL-DEC 2011	JAN-JUN 2012	JUL-DEC 2012	JAN-JUN 2013	JUL-DEC 2013
ET/TT	1.426	1.603	1.612	1.319	1.437	1.737	1.329	1.297
Line	0.927	0.534	0.769	0.856	0.702	0.579	0.791	0.710
Drain	3.636	3.099	4.029	3.957	4.813	3.815	5.158	4.384
Total	5.988	5.236	6.41	6.132	6.953	6.131	7.247	6.391

Table 4: Breakdown of displacement incident rate by tube type.

However, the total number of displacement had slightly increased especially on drains and the rest remained the same throughout the reviewed period (Table 4).

Displacement of endotracheal tube (ETT) and tracheostomy tube (TT) may have serious life threatening outcomes. It is observed that patients usually received less, or even no, sedation during weaning which further increases their discomfort when they have to cope with their physiological stress of the weaning process. The nursing strategies may be, a) promoting patient comfort during intubation, b) better communication between nurse and patient, and c) nurses staying at the bed-side to decrease the risk of self-extubation.

Displacement of central venous catheter (CVC) and renal replacement vascular accesses (Haemodialysis Catheter) might cause interruption of life saving therapies. Most of the causes were related to inadequate anchoring of the catheter, e.g. the CVC inserted in operation theatre had frequently no anchoring stitches applied. Therefore, the catheter would easily displace or dislodge. There was no data on displacement of pulmonary artery catheter (PA catheter) after 2010 which might be related to the preference of using echocardiogram to monitor the hemodynamic status of patients rather than using PA catheter. Avoidance of vascular line displacement remains an important focus to address, in particular about the practice of securing the catheters.

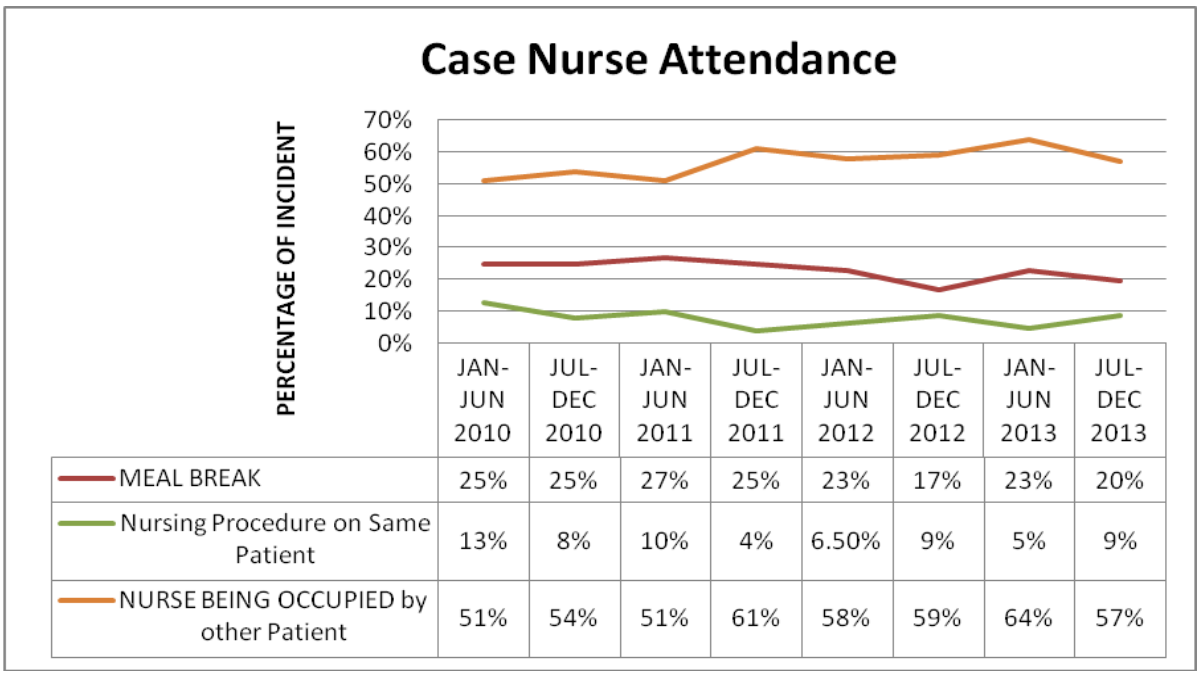
Displacement of nasogastric tube (NG) for feeding accounted for high percentages in several reports. NG tube is the most commonly used tube being inserted in ICUs. Usually no anchoring stitch is applied and patients may easily pull it out. Although no life threatening incident that was due to NG feeding tube displacement was recorded, the displacement could

contribute to higher risk of aspiration, and the repeated insertions could cause discomfort and injury to patient. It is highly recommended to make an extra effort in securing the NG tube, especially when it serves as a drain and is placed intra-operatively. On the other hand, the displacement of thoracic drains may cause potential fatal outcomes such as tension pneumothorax. Therefore, it is highly recommended that individual hospitals should pay attention to the rising trend and focus on prevention of these incidents (Table 7).

In our experience most of the tube displacements happened during night shifts. However, when the length of shift was taken into account, the incident rate during night shift was nearly the same as day time. While the nurse: patient ratio for night shifts was less in most hospitals in the public system, it was recommended that nurses should make extra efforts to maintain the quality of care during night shifts.

ANALYSIS OF INCIDENTS

The top three environmental factors contributing to occurrence of incidents (Table 5) were when nurses were occupied with providing care to other patients, during meal / tea break and during nursing procedures. This implied that patients being less attended to or unattended had a higher risk of displacement of tube/line/drain. These reasons appear to be related to the nurse: patient ratio during night shifts.



	JAN-JUN 2010	JUL-DEC 2010	JAN-JUN 2011	JUL-DEC 2011	JAN-JUN 2012	JUL-DEC 2012	JAN-JUN 2013	JUL-DEC 2013
MEAL BREAK	25%	25%	27%	25%	23%	17%	23%	20%
Nursing Procedure on Same Patient	13%	8%	10%	4%	6.50%	9%	5%	9%
NURSE BEING OCCUPIED by other Patient	51%	54%	51%	61%	58%	59%	64%	57%

Table 5: Tube displacement correlation with other activities occupying nurse's attention.

The presence of the ICU nurse was a crucial factor in prevention of tube displacement incidents. It would be necessary to adjust the manpower arrangement during meal time or tea breaks because it was found that during shift hand-over and meal/tea break, patients were prone to have tube/line/drain displacement. In addition, arrangement of work to perform non-urgent labour intensive activities should be done only when there was adequate manpower. Around 8% of tube/line/drain displacement incidents occurred during nursing procedures. It is recommended that nurses should be more alert to maintain all tubes, lines and drains during procedures to prevent displacement. Assigning staff as patrol nurses to perform patient safety rounds would be recommended especially during high risk period.

FACTORS CONTRIBUTING TO THE INCIDENTS

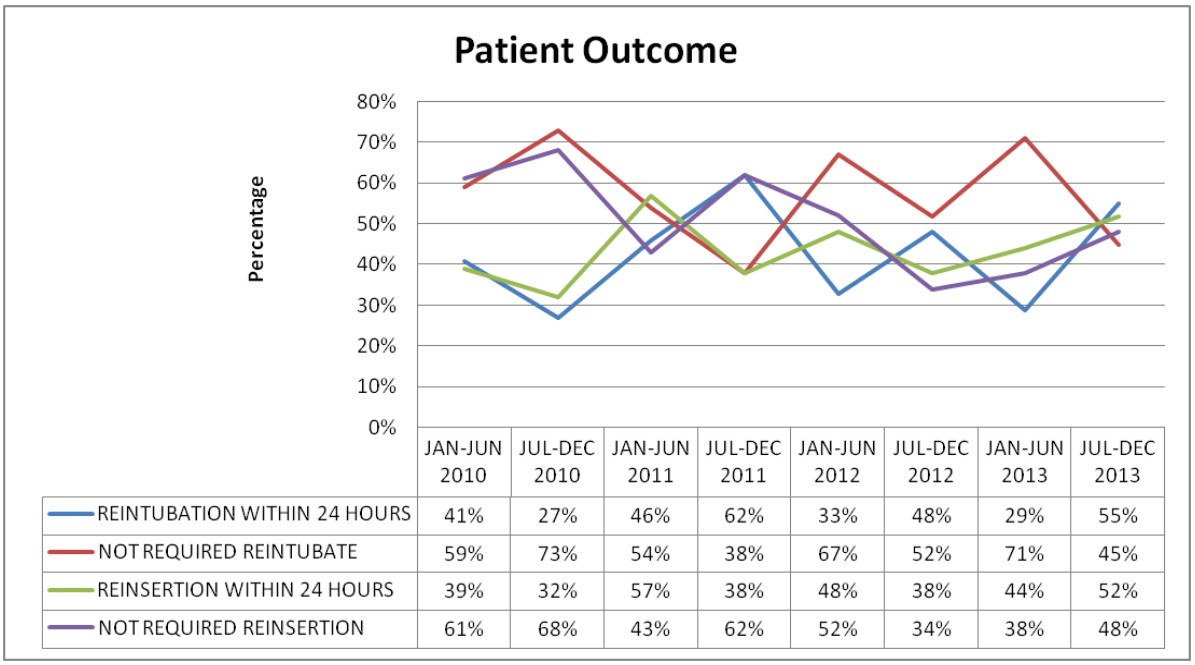
Patient Factors - The presence of tube, line and drain might cause great discomfort to patients. Nursing measures were implemented to minimize patient's discomfort including nurse reassurance, effective communication, and appropriate use of physical restraint. There were many cases when physical restraints were applied and periodic reviews on the effectiveness of restraint were needed. As mentioned earlier in this report, patients with minimal or no sedation during weaning stage were running the risk of having tube/line/drain displacement incident(s). Effective communication between doctors, nurses and the healthcare team members is essential to ensure a balance between appropriate sedation and prevention of displacement incidents.

System Factors - The commonest cause of displacement incidents was due to high activity levels. This implied that nurses were occupied by various activities and attention to certain patients could have been diverted.. Poorly secured tube/line/drain was the second commonest system factor contributing to displacement incidents. Individual ICUs should continue to work out the best methods to avoid incidents. Patient's in isolation rooms was the third common system factor. Nevertheless with the increase in awareness of infection control measures, there might be more patients requiring isolation. It was recommended that nurses should be more alert to patients located in isolation rooms.

Human Factors – Incidents occurred and were possibly related to not addressing a patient care need. For example, one patient complained about the discomfort with the nasal gastric tube and the nurse should have attended to him immediately. Nurses should remind other healthcare professionals about the presence of drains and tubes when the patient has to undergo bedside procedures. Frequent observation and continuous assessment should always be maintained.

PATIENT OUTCOMES

Artificial airway is a very important life saving device for ICU patients. Among those displacement of ETT and TT, **an average of 43% of the related patients required re-intubation.** Individual ICUs should pay special attention to their own incidents and implement appropriate preventive measures to prevent tube displacement. Findings from January 2010 to December 2013 (Table 6) showed no significant differences in the requirement of reinsertion of line or drain after displacement.



	JAN-JUN 2010	JUL-DEC 2010	JAN-JUN 2011	JUL-DEC 2011	JAN-JUN 2012	JUL-DEC 2012	JAN-JUN 2013	JUL-DEC 2013
REINTUBATION WITHIN 24 HOURS	41%	27%	46%	62%	33%	48%	29%	55%
NOT REQUIRED REINTUBATE	59%	73%	54%	38%	67%	52%	71%	45%
REINSERTION WITHIN 24 HOURS	39%	32%	57%	38%	48%	38%	44%	52%
NOT REQUIRED REINSERTION	61%	68%	43%	62%	52%	34%	38%	48%

Table 6: Reintubation (ETT) and reinsertion (TT) rates in source ICUs

CONCLUSION

The overall ICU displacement incidents were similar in contrast with the increasing bed days occupied, which reflected that the current measures in preventing displacement incidents among various hospitals were effective. It requires a multi-disciplinary approach in preventing displacement incidents. Effective communication among doctors, nurses and health care assistants is essential. Identifying patients at risk, time at risk can help to initiate proactive measures to prevent line/tube displacement.

RECOMMENDATIONS

It was found that the types of tube displacement with high incidence rates over the period of four years (2010 to 2013) were endotracheal tubes and nasogastric tubes. Frequent reminders and explanation to patients about the importance of the tubes could help to prevent

self-extubation. Staff should be on the alert for restless and uncooperative patients during duty handover. Before leaving the at-risk patients, nurses should ensure that all life supporting devices are properly secured and, if necessary make arrangement for supporting staff to actively monitor patients.

Appropriate staff deployment could minimize the occurrence of incidents. Nurses should be encouraged to call for help when they are expected to be occupied for a long period of time. Reassurance and promotion of comfort could help to gain the cooperation from patients. Senior nurses should remind staff to hold tubes, lines and drains carefully and stay alert when they are repositioning patients and/or equipment.

Reviewing major incidents, especially the avoidable cases, could raise staff awareness. Posting of the incident numbers and trends in the working area can remind and enhance staff alertness. Heightened staff awareness coupled with caring attitude is essential to minimizing displacement incidents.

THE WAY FORWARD

It is proposed to enhance communication between doctors and nurses during weaning stages for sedation control, and the appropriate time for extubation. With an aim to shorten patient's length of stay in ICU, trials on nurse initiated extubation in weaning patients from ventilators may be able to minimize displacement incidents. Furthermore, proper use of sedation scoring scales could minimize patients' discomfort. Periodic patient safety rounds are

a pro-active measure to identify patients at risk of incidental displacement so that prompt preventive measures can be implemented. Briefing and debriefing on post displacement incidents are encouraged so as to have the cases reviewed and good practices shared in order to achieve better patient outcomes. Near-displaced incidents should be mentioned to colleagues to prevent displacement to happen on the same patients again. It is invaluable to continue having this self-reporting system of displacement incidents with a blame-free or no blame culture.

Appendix 1

(Name of Institution) **Tube/ Line/ Drain Incident Reporting form**	**Patient Gum Label** **or** **Patient HN:_____**

Definition of Displacement of tube/ line/ drain:

It is an unintended event. The appropriate location or marking of tube / drain is found to be different from the previous observation or record, and its primary function cannot be achieved.

Date of incident: _____ Time:_____(AM / PM / N shift)

Displaced by: patient nurse doctor unknown supporting staff others: _____

Description of incident:

Displacement of tubes **:** Been inserted for _____ days Endotracheal tube Tracheostomy tube	***Displacement of central lines:*** Been inserted for _____ days Site: _____ Central venous catheter Pulmonary artery catheter Renal replacement access line Other: _____	***Displacement of drains*** **:** Been inserted for _____ days Head drain Thoracic drain Abdominal drain Urinary catheter Mediastinal drain Other: _____
Displacement of Nasal GastricTube **:** Been inserted for _____ days For Feedings Drainage		

Incident Background

Factors contributing to incident (can tick more than 1box if appropriate)

Incident occurred during : (please tick box(es) and circle either one factor) ☐ Shift handover / meal or tea break / night food break Patient undergone ☐ ***Nursing procedures*** : bed bath / ambulation / admission / discharge / transportation_____ ☐ ***Medical procedures***:_____ ☐ ***Other procedures:***_____ ☐ Case nurse occupied by: other patient care / preparation works / ward round / ☐ Others : _____	***Patient factor : (can tick more than 1 box)*** Sedation: ☐ Yes ☐ No Restless: ☐ Yes ☐ No Communication problem: ☐ Yes ☐ No Physical restraint:: ☐ Yes secured / loosen ☐ No Cooperation: ☐ Yes ☐ No ☐ Others: _____
System factors: ☐ Poor design/ maintenance of equipment : _____ ☐ Poor quality of material: _____ ☐ Tube / drain / line poorly secured ☐ High activity level ☐ Below normal staff and patient ratio * ☐ Inadequate protocol ☐ Inadequate training ☐ Inconvenient patient allocation: Side/Isolation room ☐ Other : _____	***Human factors:*** ☐ Inadequate patient assessment ☐ Inadequate competent ☐ Unfamiliar with unit protocol / guideline ☐ Distraction / Inattention ☐ Other: _____

- * Subject to individual hospital's ICU/HDU bed nature
- ***** During night shift / meal break, staff patient ratio is half of that of day shift and regarded as normal

Patient Outcome:

☐ Reinsertion of line and drain is required within 24 hours ☐ Reintubation is required within 24 hours	☐ Reinsertion of line and drain is not required ☐ Reintubation is not required

Evaluation:

The incident is : ☐ Unavoidable ☐ Avoidable Improvement initiatives:

Reported by:

Rank:_____ Name:_____ Signed:_____ Date:_____

Reviewed by:

Rank:_____ Name:_____ Signed:_____ Date:_____

Thank you for your reporting!

This report is used for data analysis. We aim to recommend solutions to prevent further displacement incidents.

MEDICATION ERRORS IN THE ICU

Medication Error (ME) & Medication Incident (MI)

The National Coordinating Council for Medication Error Reporting and Prevention (2009) defined a medication error as "any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of health care professional, patient, or consumer. Such events may be related to professional practice, health care products, procedures, and systems." Another extensive review of medication safety in the ICU by Kane-Gill et al. (2006) defined medication errors as "preventable mistakes or a deviation in planned action."

Medication errors are major issues in the health care setting and particularly prevalent in highly technical specialty areas such as the ICU.

Medication Incident (MI) which stresses the quality processes of the drug administration, is now used in modern literature. Medication incidents include errors in prescribing, dispensing and drug administrations. The incidents may be patient involved or non-patient-involved.

The measure for the rate per 1,000 bed days occupied would be computed as:

- **Numerator Statement:** Total Number of medication incident occurred x1000
- **Denominator Statement:** Total number of patient days during the period (Total number of Bed Days Occupied)

MEDICATION INCIDENTS IN ICU

Critically ill patients receive nearly twice as many medications as patients in general care units, and as a result, are at risk for a potentially life-threatening error during their hospital stay (Eric 2008). Reviews have estimated that patients in the ICU can encounter on average 1.7 errors per day, with nearly 50% of all ICU adverse events being medication related (Donchin 1995 & Rothschild 2005).

Patients in the ICU are at higher risk for adverse drug events for many reasons. These include illness severity, complexity of care, frequent use of complex drug regimens, high-alert medications, and the need for frequent drug dosing. Additionally, the busy environment, heavy workload and frequent stressful situation for the staff can predispose the ICU setting to having a greater incidence of medication errors (Vos 2007).

DATA REPORTING

Medication errors (MEs) in ICU can place patients at risk of injury or death. It is essential to minimize and prevent the incidence of MEs, hence offering the best protection to our patients. A comprehensive data collection system with the aim to establish a database on medication errors which includes all error reports related to medication use in the prescribing, administration, dispensing and preparation is needed.

Some hospitals use the Advanced Incident Reporting System (AIRS) to report medication incidents. AIRS is a web-based electronic system serving as a tool to support risk management by facilitating the reporting, classification, analysis, management of incidents and marking improvement.

The report includes the following information: patient information, the location and time of the incident, a description of what happened and what was done about it, the condition of the patient, the event outcome, severity index describing patient outcomes following medication errors as in **Table 1 & 2** and any additional information required by the facility policy. A comprehensive medication incident form is essential for the data collection and for root causes analysis to evaluate the factors and prevention measures for improvement in medical safety as the sample **Form 1.**

Form 1 - Medication Incident Report Form

Date: _____/_____/_____ Duty Shift: ☐ A ☐ P ☐ N

Case Nurse:			
Error Identified by:			
Residents(s) involved:			
Type of Errors (circle all that apply)	1. Prescribing	● Wrong Drug ● Wrong Dosage form ● Wrong Strength/dosage ● Wrong Duration ● Wrong Frequency ● Wrong Route	● Wrong Abbreviation ● Wrong Instruction ● Wrong Patient ● Double Entry ● Drug Omission ● Known Drug Allergy
	2. Dispensing	● Wrong Drug ● Wrong Dosage Form ● Wrong Strength/dosage ● Wrong Quantity ● Known Drug Allergy	● Wrong Patient ● Wrong Label information ● Double Dispensing ● Drug Omission
	3. Administration	● Wrong Drug ● Wrong Dosage Form ● Wrong Dose ● Wrong Flow Rate ● Wrong Patient ● Wrong Route/methods	● Wrong IV diluent ● Wrong Time ● Extra Dose ● Dose Omission ● Unordered Drug ● Known Drug Allergy
When did this occur?	Date/s:	Time/s:	
When was the incident identified?	Date/s:	Time/s:	

Describe the medication incident of error:			
Possible reason(s) for incident:			
Immediate action taken:			
Reported By:		Signed:	

Supervisor notified (Name/ Rank):	☐Yes ☐No	Date/Time:
Doctor notified (Name/ Rank):	☐Yes ☐No	Date/Time:
Pharmacist notified	☐Yes ☐No	Date/Time:
Next of Kin notified:	☐Yes ☐No	Date/Time:
Treatment ordered by Doctor/ Pharmacist (Name/Rank):		

Support Worker/ Coordinator to Complete – Incident Analysis

Category of Incident:

- ☐ Incorrect client
- ☐ Incorrect medicine
- ☐ Incorrect dose
- ☐ Incorrect time
- ☐ Incorrect route
- ☐ Split or dropped medicine
- ☐ Out of date medicine
- ☐ Missing medicine
- ☐ Lack of documentation such as assessment, medication order, medication support plan, medication record sheet(if required)
- ☐ Request by a client/care to not give medication
- ☐ Breach of the Organization policy and guidelines
- ☐ Client refuses medication
- ☐ Incorrect storage of medications
- ☐ Incorrect supply of medications from the pharmacy
- ☐ Other (describe)

_____

_____

_____

Coordinator to complete—Incident Analysis Conclusions

What, if anything could have prevented the incident?

Describe:

Was the incident related to a procedure breakdown (staffs focus)? ☐ Yes ☐ No

Comment:

Was the incident related to the medication management system (Prescription, supply, documentation focus)? ☐ Yes ☐ No

Comment:

Was the immediate action taken appropriate? ☐ Yes ☐ No

Comment:

Coordinator to Complete – Action Plan (Insert further actions as required)	Who	by When	Date Completed
Analysis completed			
Follow up with staff member/s			

Coordinator to Complete – Closure

Evaluation (If appropriate, describe how action/ improvements were evaluated and the result):

Outcome or end result: (Tick applicable boxes)

□ Issue resolved – no improvements implemented

□ Improvement implemented

(describe) :_____

Closed Out/ Complete:

Coordinator's Signature: _____ Date: _____

CLASSIFICATION OF PATIENT INJURY AND MANAGEMENT

Table 1 Classification of patient injury (Severity Index = SI)

SI = 0 Incident occurred but stopped before reaching	**SI = 1 Incident occurred (reached patient) but no injury sustained.**	**SI = 2 Minor Injury**	**SI = 3 Temporary morbidity**	**SI = 4 Significant morbidity**	**SI = 5 Major permanent loss of function/ disability SI=6**	**SI = 6 Death**
	May have required monitoring. No investigation is required	Required monitoring &/ or investigation	Required monitoring &/or investigation	Required transfer to a higher care level		
		No change in vital signs	Some changes in vital signs	Significant changes in vital signs		
	No treatment required	Required minor treatment *(e.g. simple wound care, analgesic)*	Required simple treatment *(e.g. suturing)*	Required emergency treatment / surgical intervention		

Table 2 Flowchart showing Medication incident Management

SITUATION	GRADING (SEVERITY INDEX)	ACTION
When an incident occurs, the first priority for staff must be to manage the incident so that patients, staff or others involved are protected from the possibility of further harm, discomfort or inconvenience **The member of staff who knows most about the incident should then 'grade' the incident**	**INCIDENT OCCURS** **STAFF ACTION**	**<u>Reporting incident</u>** **1. Patient safety incident** **2. Incident of specific nature** **3. Incidents requiring immediate management intervention** **1. Manage the incident** **2. Grade severity of the incident** **3. Report incident through AIRS by the member of staff who know most about the incident**
Based on the color grading for the incident, the member of staff should take the relevant action outlined in the flowchart above.	**SEVERITY INDEX: 0, 1**	**1. Manage the incident through routine procedures** **2. Report to management within 48 hours**
This will involve reporting through AIRS and, for more serious incidents, will also involve immediate reporting to management in accordance with local procedures	**SEVERITY INDEX: 2,3**	**1. Management action needed** **2. Report to management within 24 hours**
	SEVERITY INDEX: 4, 5, 6	1. **Urgent management action needed** 2. **Report to management immediately**

TYPES & CAUSES OF MEDICATION ERRORS

Medication procedures in the ICU can be broken down into steps from drug prescription, transcription, dispensing to administration procedures with up to 40 steps being involved. The prescription process is initiated by a physician who enters the prescription into a dedicated computer system, prints, revises, and signs the prescription form. The nurse plans the corresponding medication timeframe and prepares any special care or apparatus required. In the central pharmacy, a pharmacist or his assistant prints the request, dispenses it and sends the ordered medications to the ICU. The medications are checked by a nurse, stores them in individual drawers identified by bed number. In due time, a nurse prepares the medication, checks the medication against the prescription and administers it to the corresponding patient.

Possible medication errors may arise during any of these steps. The types of medications errors in **Table 3** can be subdivided according to three key processes: prescribing, dispensing and administration processes.

Table 3 Types of Medication Errors

1. Prescribing	● Wrong Drug ● Wrong Dosage form ● Wrong Strength/dosage ● Wrong Duration ● Wrong Frequency ● Wrong Route	● Wrong Abbreviation ● Wrong Instruction ● Wrong Patient ● Double Entry ● Drug Omission ● Known Drug Allergy
2. Dispensing	● Wrong Drug ● Wrong Dosage Form ● Wrong Strength/dosage ● Wrong Quantity ● Known Drug Allergy	● Wrong Patient ● Wrong Label information ● Double Dispensing ● Drug Omission

3. Administration	● Wrong Drug ● Wrong Dosage Form ● Wrong Dose ● Wrong Flow rate ● Wrong Patient ● Wrong Route/method	● Wrong IV diluent ● Wrong Time ● Extra Dose ● Dose Omission ● Unordered Drug ● Known Drug Allergy

A cross-sectional study of all hospital ICU and non-ICU medication errors reported to the MEDMARX system between 1999 and 2005 was performed in 2013 (Latif, A., 2013). **MEDMARX** is an anonymous, self-reported, confidential, de-identified, internet-accessible medication error reporting program that allows hospitals to report, track, and share medication error data.

There were 839,553 medication errors reported from 537 hospitals. Among them, ICUs accounted for 55,767 (6.6%) errors, of which 2,045 (3.7%) were considered harmful. Non-ICUs accounted for 783,800 (93.4%) errors, of which 14,471 (1.9%) were harmful. This study showed that the medication incidence in the ICU is 2 folds more serious compared with the general hospital cases. Errors most often originated in the administration phase (ICU 44% vs. non-ICU 33%). The most common error type was omission (ICU 26% vs. non-ICU 28%). Among harmful errors, dispensing devices (ICU 14% vs. non-ICU 7.1%) and calculation mistakes (ICU 9.8% vs. non-ICU 5.3%) were more commonly identified to be the cause in the ICU compared to the non-ICU setting.

In one study investigating the incidence types and causes of medication errors in ICU, a variety of factors were identified (Bohomol et al. 2009) The most plausible causes for the

occurrence of medication errors in their study are listed in **Table 4**. The drug availability, stock and distribution problems accounted for over 50% of the causes of errors.

Table 4 Causes of Medication Errors in ICU (Bohomol E et al.2009)

Causes	Percentage (N = 300)
Drugs N/A at the institution	***41.0***
Stock or distribution problems in pharmacy	***16.3***
Transcription of the prescription failure to pharmacy	***11.0***
Communication failure among services	***8.0***
Prescription-related problems	***7.0***
Slips, memory lapses, and failure to check medication	***6.6***
Work overload and disruption	***5.0***
Others	***3.7***
Infusion pump problems	***0.7***
Protocols not follow	***0.7***

A retrospective evaluation of voluntarily reported medication errors over 4.5 years at a 647-bed academic medical center containing greater than 120 ICU beds identified a predominance of prescribing and drug omission errors (Risk Alert 2014). There were a total of 3252 medication errors reported with 541 and 2711 occurring in ICUs (16.6%) and general care units (83.4%) respectively. Primary types of medication errors were prescribing errors in the ICUs and drug omission errors in the general care units. Evaluation of these medication errors show the primary underlying cause were procedure/protocol not followed and knowledge deficit in the ICU and general care units. More frequently there was no contributing factor identified for medication errors in the ICUs.

A review of medication incidents among Hospitals under Hospital Authority in Hong Kong during a full year period (July 3013 – June 2014) in **Table 5** also revealed similar findings: the wrong strength dosage, wrong drug and dose omissions were the most common inpatients medication errors.

LOCAL DATA ON MEDICATION INCIDENTS

Table 5 Medication Incident Statistics (Inpatient) (Jul-Dec 2013 / Jan-Jun 2014)

	Top 3 Most Common Error Types (Inpatient)		
	PRESCRIBING ***2013 / 2014***	***DISPENSING*** ***2013 / 2014***	***ADMINISTRATION*** ***2013 / 2014***
Rank	**Inpatient**	**Inpatient**	**Inpatient**
1st	Wrong Strength/ Dosage (30% / 40%)	Wrong Drug (50% / 30%)	Dose Omission (21% / 36%)
2nd	Wrong Drug (0% /14%) *Wrong Patient 14% / 0%*	Others (0% / 7%) *Wrong Strength / Dosage 20% / 0%*	Wrong Drug (25%) *Extra Dose 15% / 0%*
3rd	Known Drug Allergy (9% / 9%)	Wrong Label Info and Wrong Strength/ Dosage (10% / 5%)	Wrong Dose (9% / 15%)

No. of Incidents by Severity(Inpatient and Outpatient)							
Severity Index	0	1	2	3	4	5	6
Frequency 2013	431	**459**	**85**	**15**	**1**	**0**	**0**
2014	**416**	**525**	**113**	**11**	**6**	**0**	**2**

(Summarized from the report of Risk Alert Issue 36 Jan 2015, A Risk management Newsletter for Hospital Authority Healthcare Professionals)

IMPACTS & CONSEQUENCES ON HEALTHCARE PROFESSIONALS & PATIENTS

Despite the best efforts in the midst of our daily work, medication errors can occur. Apart from causing considerable mortality, morbidity, and additional health care costs, it also

poses substantial impact and consequences on health care practitioners and patients when a medication error occurs (Benkirane 2009).

Health care Professionals

However, little attention has been paid to the feelings of health care professionals involved in the incidents. They may experience uncomfortable feelings of personal vulnerability and professional fallibility; guilt, panic, remorse, self-doubt, and self-blame (Porter 2014). Some may be fearful about the safety of their patients and about disciplinary actions and punishment for their mistakes; fear malpractice lawsuits and possible criminal charges if a fatal incident occurs (Eric et al 2008). They may even have feelings of doubt about their professional abilities. Healthcare personnel involved in an incident can benefit from psychological support which can create an environment that fosters open and honest discussion about errors.

Nurses

Fears of negative consequences can be a major obstacle to accurate reporting of errors, with as many as 50% to 96% underreported. How nurses choose to respond to the occurrence of a medication error is recognized as an ethical imperative (Gallagher 2008). It is not an easy action to divulge medication errors. Nurses are still expected to provide responsible care and be fully accountable within their scope of practice. When medication errors are discovered, nurses have moral obligations of accountability and responsibility to account for the mistakes with disclosure (Porter 2014). It is also an opportunity to practice virtuous characteristics, particularly honesty and trustworthiness.

Research has demonstrated that four factors affect nurses' willingness to respond to an ethical dilemma or question, such as whether to report a medication error: ethics knowledge, clinical expertise, concern for ethical issues, and nurses' perceived level of influence in their unit (Hamric 1999). There are several strategies for ethical responses surrounding medication errors in ICU (Porter 2014):

1. Be accountable to yourself and your coworkers
2. Admit when medication errors occur
3. Resist the culture of "Name, Blame, and Shame"
4. Avoid workarounds in medication management processes

Whenever a patient has experienced an iatrogenic injury, disclosure of the incident should take place and should be guided by the following principles (Camiré 2009):

1. Perform in a timely fashion – as soon as possible after the injury, while ensuring the patient's well-being.
2. Perform in a quiet room free of interruptions.
3. Disclose facts without speculation, opinion or blame.
4. Use simple, unambiguous lay words.
5. Include an expression of sympathy.
6. Allow time for questions.
7. Document disclosure in the medical record.

Physicians

Physicians have the responsibility to write orders for medications and prescribe medications. At this vital first step, errors can occur in various ways, for instance, illegibility of orders, incomplete orders, incorrect doses, inappropriate doses for narrow therapeutic range for liver or kidney function, failure to verify allergies, and failure to reconcile medications leading to omitted medications or extra doses of medications (Bohomol 2009 & Frith 2013). In a study of prescribing errors. 7.53 errors per 1000 prescriptions were identified (Jayawardena 2007). Research explored the effect of perceived stress; caseload, perceived workload, and hours of sleep of physician on medication errors (Eric et al 2008). Clinicians should understand the reasons for medication errors from a human factor perspective.

Pharmacists and Dispensers

Hospital pharmacies dispense large numbers of medication doses for hospitalized patients. Previous studies have also reported conflicting rates of pharmacy dispensing errors, ranging from 0.0041% to 3.6%. One study relied on self-reporting to detect dispensing errors and identified underestimation of the incidence of these errors (Brixey 2008). The study found an overall unweighted pharmacy dispensing error rate of 3.6% (5,075), of which 2.9% (4, 016) were detected errors and 0.75% (1,059) was undetected errors. Several factors identified in the dispensing process included human fatigue, process workarounds , confusion surrounding look-alike and sound-alike medications, and repetitive tasks for filing and checking the dose dispensed. The process involved routinely used medication; the high volume of medications filled and verified can also lead to a high number of errors.

Patients and Family

A systematic review of direct observation evidence over medication errors in critically ill adults showed that increased monitoring was the most common consequence of medication errors, whilst life-threatening and fatal adverse events were rare (Kiekkas 2011).

Patients in the ICU and their families are most vulnerable. They have limited ability to control the environment and invasive technology and a sense of intimidation by the critical illness experience. A climate of trust is indispensible for patients and families to overcome their vulnerability and powerlessness (Porter 2014).

Risk Factors and Prevention Measures

Risk Factor

A thorough root causes analysis is a common structural tool conducted in the organization for revealing underlying system deficiencies and risk factors, for both error analysis and development of action for system improvement and prevention measures. Medication errors (MEs) are more common in the ICU due to poly-pharmacy and the stressful environment. The underlying cause for such errors may be professional practice, health care products, procedures and system related (Agalu 2012). Medication errors are associated with human factors that include stress, high workloads, knowledge deficit and performance deficits. Factors contributing to medication errors are frequent interruptions, communication problems, and poor fit of health information technology to the workflow of providers (**Table 6)** (Frith 2013). The potential risk factors for medication errors in ICU are categorized in **Table 7** (Moyen 2008).

RISK FACTORS & PREVENTIVE MEASURES

Table 6 Contributing factors for MEs - System related (*Frith, 2013, p391)*

Lighting
Noise level
Frequent interruptions and distractions
Training
Staffing
Lack of availability of health care professional
Assignment of placement of a health care provider or inexperienced personnel
System for covering patient care
Policies and procedures
Communication systems between health care practitioners
Patient counseling
Floor stock
Preprinted medication orders
Others

Table 7 Potential risk factors for medication errors (MEs) in ICU (Moyen 2008)

Factors		Risk factors
Patient	Sedation	Patient unable to participate in care and defend themselves against errors
Health care providers	Communication	Verbal and written communication Misinterpretation of the order
	Staff performance	Valuable insight into unsafe practice Knowledge and performance deficit
Medications	Types of medications	Frequent boluses and infusions dose Complex mathematical calculations of dosage Programming of infusion pumps
	No. of medications	Many medications prescription
	Labeling	Immediate container labels of product - Proprietary (trade)name confusion - Established (generic) name confusion
	No. of interventions	Increased risk of complications
ICU environment	Complex environment	multitasking and fast pace of medical care High stress High turnover of patients and providers
	Emergency admissions	Risk of adverse event
	Multiple care providers	Challenges the integration of different care plans

Prevention measures

Improved medication safety can be accomplished by optimizing the safety of the medication process, eliminating situational risk factors, and providing strategies to both intercept errors and mitigate their consequences.

The safest and most efficient means of improving patient safety is to improve the safety of the medication process (Moyen 2008). Strategies in **Table 8** that have been shown to be successful including medication standardization, computerized physician order entry (CPOE), bar code technology, and use of computerized intravenous infusion devices.

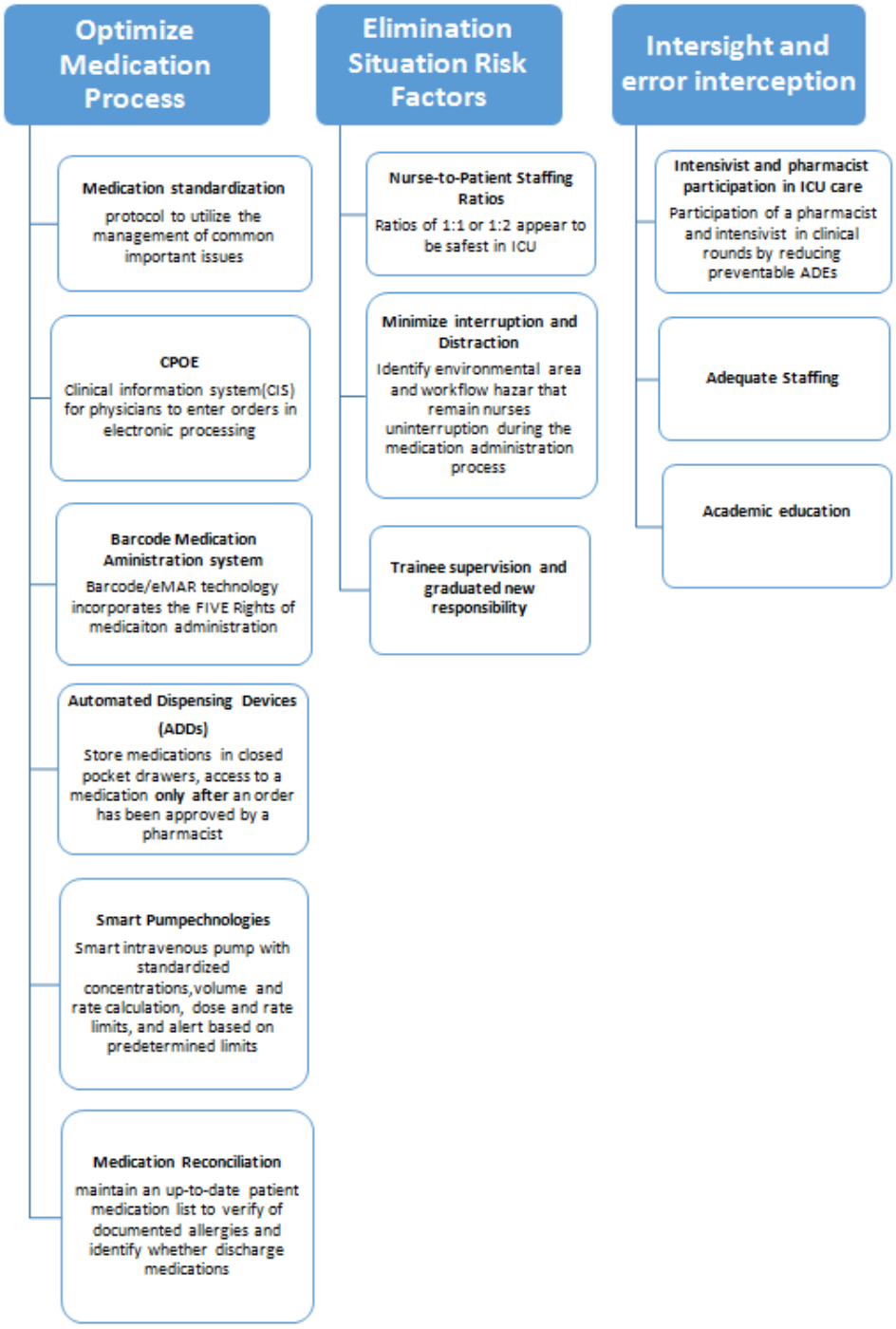
Table 8 Strategies to Prevent MEs

Reorganize the medication process
1. Medication standardization 2. CPOE and clinical decision support 3. Bar code technology 4. computerized intravenous infusion devices 5. Medication reconciliation
Eradicate situational risk factors
1. Avoid excessive working hours 2. Minimize interruptions and disturbances 3. Trainee supervision and one's own responsibility
Mistake and error interception
1. Adequate staffing 2. Intensivist and pharmacist participation in ICU care 3. Incorporation of quality assurance into academic education

The high-risk nature of medication administration, particularly in the critical care setting, is contributing factors that can lead to medication-related safety events. Recently adopted medication safety technologies such as computerized provider order entry (CPOE), bar code medication administration systems and smart pump technology are showing significant impact in decreasing risks associated with medication use as summarizes in **Table 9** (Bates

1999, Poon 2010, Rothschild 2005 & Keohane 2005). CRICO's Comparative Benchmarking System (CBS) data show that medication-related malpractice claims have decreased approximately 40 percent over the past five years, likely due in part to the adoption of new safety technologies.

Table 9 Preventive Measures for Medication Errors



RECOMMENDATIONS

Nurses often represent the ‘last line of defense’ against medication errors. However, interruptions during medication administration process can range from questions from other colleagues, patients, families; monitors, alarms, and pagers to patient activity (Academic Medical Center 2012). Some interruptions are obviously necessary for the swift communication of critical clinical information. As a result, efforts should only be aimed at reducing those interruptions that are not relevant to patient care (Redding 2009). Whereas the positive effects of delivering real-time clinical information are enhanced (Brixey 2008). On the other hand, there are also limitations associated with innovative technologies for medication safety. Providers should be aware to avoid over-reliance on technology. Critical thinking is of utmost importance, not only as it relates to drug dosage, timing, and selection, but also as it relates to the overall patient condition, clinical situation, and interpretation of clinical data (AMC 2012).

To implement effective strategies for medication safety through decreasing risks, both **Table 10 and 11** highlight the essential practice recommendations (Academic Medical Center 2012 & Frith 2013). ICU nurses play a crucial role not only in setting strategic goals for medication safety but also in executing those goals and maintaining a culture of safety. Nevertheless, patient safety is the top priority in providing high-quality health care, and ensuring the safety of patients is everyone’s responsibility and challenge.

Table 10 Strategies for Improving Medication Safety (AMC, 2012)

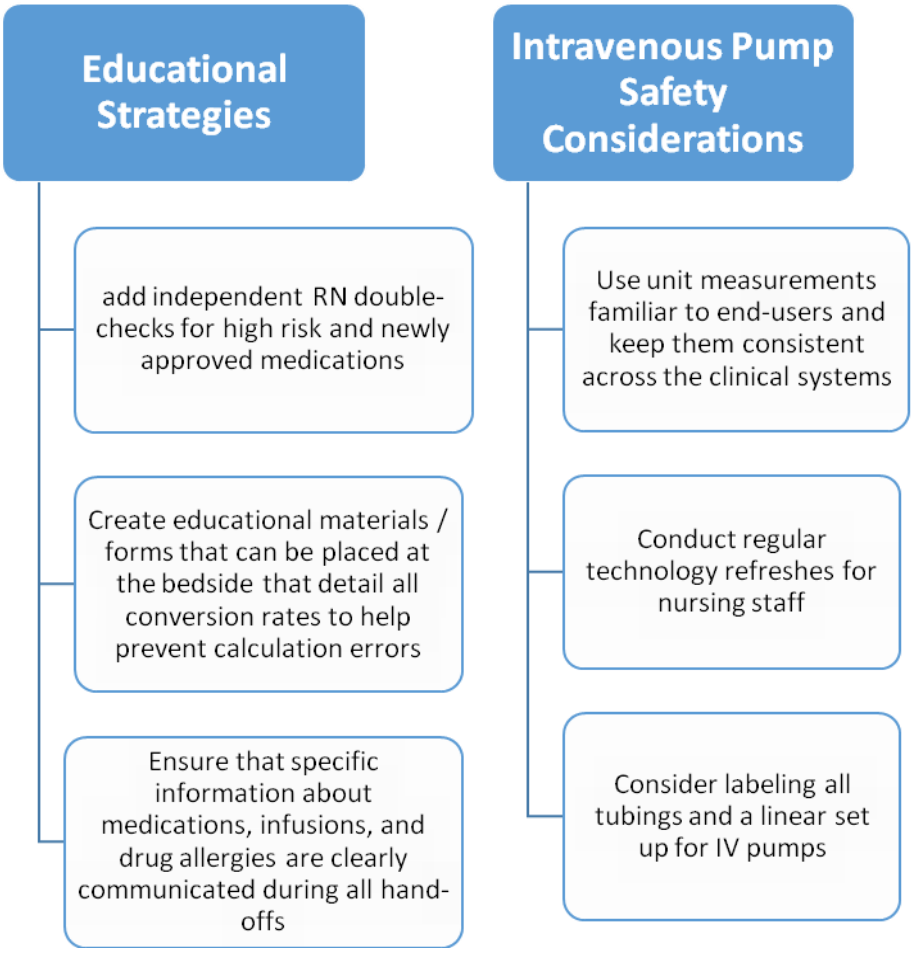


Table 11 Interventions to improve Medication safety in ICUs (Frith, 2013)

Medication Safety Interventions
Culture
Assess baseline culture of safety
Utilize a closed loop communication (check back) among interprofessional team
Encourage nameless reporting system of errors and near-misses
Encourage speak up accountability
Examine medication errors in systematic approach and in complete picture
Consider slips and lapses as symptoms of preoccupied failure
Person
Encourage countercheck with other providers when prescribing medications
Review and share causes and interceptions for medication errors from a cognitive processing perspective
Reschedule ICU nurses working hours between shifts
Tasks
Minimize multitasking during medication preparation and administration
Simplify protocols or procedure steps for medication safety
Increase automation technology of tasks whenever possible
Technology
Select closed loop technology for medication prescribing, dispensing, and administration
Educate staff and make changes to technology
Environment
Provide quiet best environment for preparation and administration of medication
Post warning signage of high-alert medications carefully
Place patient medications in locked drawers in patient rooms

PATIENT AND FAMILY SATISFACTION IN THE ICU

Promoting patient and family satisfaction with care is a key component of providing quality care in the ICU (de-la-Cueva-Ariza et al., 2013). Traditionally, the goal of intensive care nursing has primarily focused on the physiological and psychological impact of life-threatening illnesses on individual patients. By incorporating the concept of patient to include the family, the critically ill patient's well-being can be improved (Lee, Chien, & Machenzie, 2000). For that reason, both patient and family experience is important for patient- and family-centered care in the ICU.

Patient and family satisfaction has become an acknowledged quality metric in the ICU. A number of studies have been conducted internationally which focus on improving the patient experience in the ICU. A pilot study was conducted in a mixed adult ICU in Netherland using a self-developed questionnaire which included 60 questions in eight domains (General satisfaction, Reception, Physical care, Mental care, Empathy and attention, Communication and information, Surroundings and Physical discomfort) to measure the level of patient satisfaction and to identify its influencing factors on ICU patients. Ninety-eight patients were interviewed. The mean overall patient satisfaction score was 4.60 out of 5. Communication and information emerged to be significant in predicting general satisfaction. Moreover, elderly, female, Dutch nationality, longer ICU stay, long duration of mechanical ventilation and a high Minimal Mental State Examination score were related to less satisfied patients (Jansen **et al.** 2008)**.**

Patient satisfaction has been associated with nursing work environment. Boev (2011) used a 26-item instrument to measure level of satisfaction of critically ill patients with care and to examine the relationship between nurses' perception of work environment and patient satisfaction in four adult ICUs in United State. The results showed that overall quality of nursing had the highest score (4.5 out of 5), followed by nurses' friendliness (4.4 out of 5), and patient's satisfaction of pain control (4.4 out of 5). Critically ill patient's satisfaction with preparation for ICU discharge had the lowest scores (4.1 out of 5). Intensive care nurses reported moderate satisfaction with work environment, with perception of the role of their nurse manager having a strong influence on satisfaction scores. Perception of nurse manager leadership and capability was significantly associated with patient satisfaction. The relationship between nurses' perception of their nurse manger and overall patient satisfaction suggests hospitals should consider putting more resources in nursing work environment improvement and nursing leadership empowerment.

However, conducting patient satisfaction surveys in the ICU can be challenging. Apart from whether critically ill patients can consciously recall their stay in the ICU, and have the ability to judge quality of health care service, the timing to perform the survey is another major issue. Most patient satisfaction surveys are conducted upon patient discharge and reflect the care they received from the unit from which they were discharged. Rarely are patients directly discharged to home from the ICU, and obtaining information related to patient satisfaction with ICU nursing care is therefore limited (Stricker et.al., 2011). Additionally, there are a lack of validated instruments to evaluate patient satisfaction with

care in the ICU and the absence of standardized instruments make benchmarking of patient satisfaction data difficult (de-la-Cueva-Ariza et al., 2013).

INSTRUMENTS MEASURING FAMILY SATISFACTION

Studies demonstrate that if a critically ill patient is unable to rate satisfaction with care in the ICU, family members can be taken as appropriate surrogates (Stricker et.al. 2011). Therefore, various assessment tools had been developed to evaluate family's satisfaction in ICU (Heyland & Tranner, 2001; Wasser et al. 2001). A search of literature had shown that there are at least three assessment tools commonly used in ICU to measure the level of family satisfaction.

FAMILY SATISFACTION IN INTENSIVE CARE UNIT

The FS-ICU-34 was developed by Heyland & Tranmer (2001). It was designed to measure the family satisfaction with care provided in the ICU. The origin FS-ICU consists of 34 items, it was conceptualized into two domains: satisfaction with overall care (18 items), and satisfaction with decision making (16 items). Content validity, clarity and readability had been tested. Cronbach's alpha (internal consistency) ranged from 0.74 to 0.95, and test and retest reliability was 0.85 (Heyland & Tranmer, 2001).

The FS-ICU-34 was further refined and validated by Wall and his colleagues (2007), and became shortened FS-ICU-24. Shortened FS-ICU-24 consists of 24 items, measuring two domains as well: "Satisfaction with Care" (14 items) and Satisfaction with Decision Making (10 items). The Cronbach's alpha score were 0.92 and 0.88 for the Satisfaction with Care and

the Satisfaction with Decision Making respectively. The two subscales showed good correlation with each other (Spearman's 0.73, p <0.001) which "suggesting that a single scale for the entire instrument was reasonable" (Wall, et al., 2007, p.275). In validity testing, the FS-ICU-24 was significantly correlated with the Family-Quality of Dying and Death (Family-QODD) questionnaire total score (Spearman's 0.56, $p < 0.001$) (Wall, et al., 2007) FS-ICU had been translated and validated for cross-cultural use. To date, it had been translated into French, Chinese, Portuguese, Hebrew, Spanish and Swedish (Canadian Association of Research at the End of Life Network, n.d.) as it is a valid and reliable tool for assessing family satisfaction in the ICU. The Pamela Youle Nethersole Eastern hospital in Hong Kong currently adopts FS-ICU-24 as an instrument to measure the family satisfaction of care in ICU.

CRITICAL CARE FAMILY NEED INVENTORY (CCFNI)

The CCFNI is a 46-item, 4-point Likert-type questionnaire with 45 specific items and an open-ended item to identify a need that was not listed on the questionnaire. The CCFNI was developed and modified from Molter's (1979) instrument by Leske in 1986 (Lee & Lau, 2002). Construct validity and internal consistency of CCFNI were examined by Leske (1991), and were established by performing factor analysis. Five dimensions of CCFNI were identified, and were labeled as need for support, comfort, information, closeness and reassurance (Leske, 1991). The internal consistency alpha coefficient of the total CCFNI was

0.92, and the Cronbach's alphas of five dimensions were between 0.61 and 0.88. This indicated that CCFNI had acceptable internal consistency.

The CCFNI has been widely used in studies and in different cultures in large scale studies (Azoulay, et al., 2001; Damghi et al., 2008; Wilson, Cavanaugh, et al., 1998). It has been translated into Arabic (Damghi et al., 2008), Spanish (Gomez-Martiinez, Arnal, & Julia, 2011), Chinese (Wong, 1995).

CRITICAL CARE FAMILY SATISFACTION SURVEY (CCFSS)

The CCFSS was developed and validated by Wasser, Pasquale & Matchett et al. in 2001. Wasser and colleagues (2001) believed that it is important to include all dimensions of care when evaluating family satisfaction with care provided in ICU.

The CCFSS consists of 20 items; it is used to measure family satisfaction with overall care in ICU. The content and construct validity were examined by Wasser and colleagues (2001), support that the CCFSS was reliable and valid; the Cronbach's alpha score was 0.93 for the 4-factor model, and 0.91 for 5-factor model. The CCFSS has five subscales: assurance (the need to feel hope for a desired outcome), information (the need for consistent, realistic and timely information), proximity (the need for personal contact and to be physically and emotionally near patient), support (the need for resources, support system, and ventilation), comfort (the need for personal comfort). Subscale correlation were not lower than 0.75 for the five-factor model and 0.856 for the four-factor model (Wasser et al., 2001).

Clinical Exemplar: FAMILY SATISFACTION IN HONG KONG ICU

Reporting family members' feedback and satisfaction of care is a key domain to provide transparency and improve the overall quality of intensive care. Two quantitative studies were identified using the CCFNI to investigate the needs and satisfaction of family members of critically ill patients in Hong Kong.

Lee, Chien and Machenzie (2000) conducted a descriptive study consisting of 30 family members who had a relative admitted to a Hong Kong ICU to explore their needs and their perception of having their needs met. Among the five need categories, reassurance and information were the most important categories. The 5 most important family needs were 'to know the expected outcome', 'to be assured that the best care possible is being given to the patient', 'to know specific facts concerning the patient's progress', 'to have explanations given that are understandable' and 'to see the patient frequently". Over 80% of family members perceived nurses as the most appropriate persons to meet the family needs. Additionally, the five family needs that could be best met by nurses were 'to talk to same nurse everyday', 'to be called at home about changes in the patient's condition', 'to receive information about the patient at least once a day', 'to have directions as to what to do at the bedside' and 'to help with the patient's physical care'. The study identified that female family members had higher ratings in the unmet need scores and the 5 highest ranking of the unmet needs included 'to talk to the doctor daily', 'to visit any time', 'to help with the patient's physical care', 'to feel it is alright to cry' and 'to talk about negative feelings such as guilt or anger'.

Another similar descriptive study was carried out in Hong Kong to investigate the needs of family members of ICU patients and to measure the extent of needs being met. The study recruited 40 adult family members of critically ill patients using convenience sampling methods. The mean scores of five need categories ranged from 2.5 to 3.7(possible range 1-4). The reassurance category was ranked as the most important then followed by closeness, information, comfort and support category. More than half (58.4%) of the family members of critically ill patients replied that their needs were met. The top 5 needs that were met most were ‘to know the expected outcome’ (95.0%), ‘to have friends nearby for support’ (95.0%), ‘to be assured that the best care possible is being giving to the patient’ (95.0%), ‘to feel that hospital personnel care about the patient’ (94.9%) and ‘to have visiting hours start on time’ (92.5%) and they were met by nurses and doctors. Needs of the reassurance category were met most (86.7%), then the closeness (61.6%), information (56.8%), support (54.7%) and comfort (35.4%) categories. Nine out of 10 needs that were met most were perceived as important which implies the health care providers satisfactorily fulfilled family members’ needs. On the other hand, the top 5 needs were met least were ‘to have comfortable furniture in the waiting room’(12.5%), ‘ to have a toilet near the waiting room’ (12.5%), ‘ to have good food available in the hospital (18.7%), ‘to have the waiting room near the patient’(22.5%) and ‘to visit at any time’(25%). (Lee & Lau, 2003).

Apart from the two studies using CCFNI, the Hong Kong Association of Critical Care Nurses (HKACCN) conducted a pilot study in 2004 to examine both patient and family satisfaction with nursing care in 3 Hong Kong ICUs. 30 samples from patients and 30 samples

from family members of ICU patients were recruited. Patients who are unconscious; with legal implication and stayed in ICU less than 48 hours were excluded in the study. ICU patient and family satisfaction questionnaires were developed and validated by expert panel. HKACCN found that:

*** Higher percentage *of graduate nurses*** showed a positive effect on patient/ patient's family satisfaction about the nursing care they received **(p =0.03) / (p =0.01)**

*** Higher percentage *of nurses with formal ICU training*** showed significant effect on patient/ patient's family satisfaction about the nurses' performance (p=**0.00)** / (p=**0.05).**

*** Higher Nurse:Patient ratio** showed significant effect on patient/patient's family satisfaction about the nurses' performance **(p=0.00) / p=0.07).**

(HKACCN 2004). Kosco & Warren, (2000) found that, "The less experienced nurses may not be as prepared to deal with the needs of family members, as nurses with more education may have more experience with communication skills and may find it easier to keep the family members informed of the condition of their loved ones."

Though small sample sizes and or single center setting limited the generalizability of the aforementioned studies, they highlight areas such as providing psychological support, giving information to update patient's progress, allowing being close to the patient and having comfortable hospital environment and facilities, deserve more attention by Hong Kong ICU nurses in an attempt to raise the satisfaction with needs met of the family members of critically ill patients.

INTERVENTION TO ENHANCE FAMILY SATISFACTION WITH ICU CARE

Family needs assessment

To enhance satisfaction level of family members of critically ill patients, family-centered care should be adopted in the ICU. Family-centered care is an approach to care that recognizes the needs of patient's family members plus the essential role that family members take part in during patient's illness (Henneman & Cardin, 2002). Studies have identified the incongruence in the perception on the importance of family needs between families members and nurses (Lee et al 2000; Maxwell et al 2007). It is beneficial for ICU nurses to assess the perception of family needs from a multidisciplinary care perspective, and to ensure that the plan of care is truly family care based (Henneman & Cardin, 2002). Therefore, strategies to improve family satisfaction on information needs and assurance & support needs as well as proximal needs are suggested for consideration.

STRATEGIES TO IMPROVE FAMILY SATISFACTION ON INFORMATION NEEDS

Use of printed information is an effective method in meeting family information needs. Azoulay et al. (2002) conducted a randomized trial in 34 French ICUs to compare comprehension of diagnosis, prognosis, treatment, and satisfaction with information given by ICU caregivers. The families in the intervention group received a family-information leaflet in addition to standard information. The results showed that family members were significantly more satisfied and had better comprehension of the ICU than the control group (Azoulay et al., 2002). In Hong Kong, many ICU nurses have participated in developing leaflets or printed

information brochures about critical illness, treatment procedure and family orientation, and have made use of the printed information aids to facilitate patients and family members' understanding of the disease process, outcomes and ICU environment.

The formal structured family meeting is another approach designed to enhance communication in the ICU. The family meeting is an important forum for discussion about the patient's condition, prognosis, and care preferences; for listening to the family's concerns; as well as for decision making about suitable treatment goals (Gay, Pronovost, Basset, & Nelson, 2009). Lautrette et al. (2007) conducted a randomized controlled trial in 22 ICUs in France and found that the use of a printed informational brochure with a proactive protocolized conference with families of patients dying in the ICU significantly lessened the prevalence and level of family member anxiety and depression and posttraumatic stress. Another study using a before-and-after design evaluated the effect of regular, structured formal family meetings on patient outcomes among long-stay ICU patients. The intervention called Intensive Communication System intervention, consisted of a structured formal family meeting conducted by two advance practice nurses (APN) within 5 days of ICU admission and weekly thereafter. Each meeting discussed medical updates, and patient's preferences for treatment, goals of care, and patient condition for determining effective treatment. Despite no significant differences between control and intervention patients in length of stay and time to tracheostomy, the APN-facilitated family meetings increased participation of bedside nurses and social workers in the family meetings. Additionally, more time was dedicated for family meetings (Daly et al., 2010). Given that the ICU nurse is always at the bedside engaging in

communication with patients and families, ICU nurses can proactively participate in formal structured family meeting to improve communication with family and in turn fulfill family informational needs.

STRATEGIES TO IMPROVE FAMILY SATISFACTION ON ASSURANCE AND SUPPORT NEEDS

The use of a needs-based education program can also have an impact on family satisfaction. A quasi-experimental study with pre- and post-test design was conducted in Hong Kong ICUs to examine the effect of a needs-based education program on the anxiety levels and satisfaction of psychosocial needs of their families. Both family members in control and intervention groups obtained information about the ICU setting and practice on the first day of the patient's ICU stay. Family members in intervention group received a pamphlet containing information about the ICU facilities and had two consecutive 1 hour education sessions conducted by an assigned nurse during the second and third day of the patient's ICU stay. The content of the education program was based on the individual family needs assessment. Additionally, daily telephone follow up was made to family members. After the needs-based intervention, the family members of the intervention group reported significantly lower levels of anxiety and higher levels of satisfaction related to information, support and assurance needs (Chien et al 2006).

STRATEGIES TO IMPROVE FAMILY SATISFACTION ON PROXIMITY NEEDS

Regarding family visitation, studies have demonstrated that patients wish to have their family visit more frequently and families want visiting hours to be more flexible, highlighting that restrictive visitation may not fulfill families need to be close to critically ill patients (Halm and Tilter, 1990; Roland, Russell, Richards, & Sullivan, 2001). Yet globally, flexible open visitation is not a standard of care in the ICU. The American College of Critical Care recommends that the patient, family and nurse determine visiting schedule collectively and advocates for open visitation in adult ICU based on case by case (Judy et al., 2007). Lee (2009) performed a quasi-experimental study in a Hong Kong ICU to investigate the effects of contract visitation on the satisfaction level of meeting families' needs. Families in the intervention group followed a contractual visiting practice that permitted an individualized approach to family visits while the control group was subjected to the usual restrictive practice. The results showed that families of intervention group had significantly higher satisfaction score in proximity and support need attainment.

In summary, promoting patient and family satisfaction is a NSOI that is used on an international basis to improve the quality of care provided in the ICU. Sharing global strategies for promoting patient and family satisfaction can help to enhance the ICU experience for patients, families and ICU caregivers. Internationally, nurses play an important role in promoting patient and family satisfaction with ICU care. Dissemination of specific strategies that have resulted in improved ICU care such as open visitation, family presence on rounds, family presence during resuscitation or invasive procedures, and other

initiatives including music therapy or pet visitation in the ICU can help to promote optimal care for patients and families in the ICU (Society of Critical Care Medicine, 2015).

CHECK YOUR PROGRESS: Assess your understanding of key points from this e-chapter.

1. Which of the following is a nurse sensitive outcome indicator?

A. nursing turnover rates

B. nursing job satisfaction rates

C. peripheral catheter insertion rates

D. pressure ulcer rates

Answer: D

2. True or False: An anticipated physiologic fall is associated with intrinsic factors such as aging, altered mental state, unsteady gait and sensory deficits, which can be prevented by specific interventions after assessment.

Answer**:** True

3. Which of the following is considered an extrinsic factor related to falls in the ICU?

A. Patient age

B. Patient mobility level

C. Patient de-conditioning

D. ICU equipment including tubes, or drainage bags

Answer: D

4. System factors contributing to the displacement of tubes, lines and drains in the ICU include all of the following except which factor?

A. Poorly secured tube/drain/line

B. Staff to patient ratio

C. Patient room location in the ICU

D. Patient positioning

Answer: D

5. Medication procedures in the ICU can be broken down into steps from drug prescription, transcription, dispensing, and administration procedures. How many steps have been identified in the total process?

   A. 10

   B. 20

   C. 30

   D. 40

   Answer: D

6. Which of the following is NOT an appropriate ethical response to medication error management?

   A. Be accountable to yourself and your coworkers

   B. Admit when medication errors occur

   C. Name, Blame, and Shame those who make serious errors.

   D. Avoid workarounds in medication management processes

Answer: C

7. True or False: Globally, flexible open visitation is a standard of care in the ICU

   Answer: False

8. True or False: Female family members may feel the need to express grief and anger over the plight of their loved one in ICU

   Answer: True

9. Patients falls are most accurately measured using the following units:

   A. Falls per 1000 occupied bed days

   B. Average falls per admitted patient, excluding ICU

   C. Total falls that resulted in an ICU admission

   D. Falls per total bed capacity.

   Answer: A

10. The HKACCN study of patient and family satisfaction with nursing care in 3 Hong Kong ICUs should that all of the following improved satisfaction with care except?

    A. High percentage of graduate nurses

    B. High percentage of nurses with formal ICU training

    C. High percentage of male nurses

    D. High Nurse:Patient ratios

    Answer: C

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