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Effective Strategy to Reduce Readmission to Intensive Care Unit : A Quasi-experimental Study with Historical Control Group

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Introduction

- High ICU readmission : 6.7% in the study site
- ICU readmitted patients:



(Tam et al., 2014; Timmers et al., 2012) (Rosenberg & Watts, 2000; Griffiths & Jones, 2002; Kramer, Higgins & Zimmerman, 2012; Badawi & Breslow, 2012)



Overseas Improvement Programmes

- Establish an outreach team
 Critical Care Outreach Team
 ICU Liaison Nurse
 Patient At Risk Team
 Medical Emergency Team
 Rapid Response Team
- Interventions:
 - Bedside support to critically ill patients
 - Skill transfer at bedside to empower ward nurses' competency to early detect patients at risk of deterioration

Griffiths & Jones, 2002

Summary of Evidences on Measures to Address ICU Readmission (15 studies)





Summary of Evidences on Measures to Address ICU Readmission

Before and after study designs with post-ICU discharge patients only

in ICU readmission by 1.8% to 6.4%

(Ball et al, 2003; Pirret, 2008; Green & Edmonds, 2004; Baxter et al, 2008)

hospital mortality significantly

(Harrison et al., 2010)

 Critical care outreach team might be one of the ways to reduce ICU readmission

Evaluation of outreach services in critical care. NHS Project,

Department of Health, UK 2002

No difference in ICU readmission

(Garcea et al, 2004; Pittard, 2003; Leary & Ridley, 2003; Williams et al 2010; Stelfox et al., 2016)

Gaps Identified

- No clear typology of outreach services
- Wide variations in
 - **Population** :
 - Intervention :
 - Outcome :
 - Composition of outreach team:
- Inconsistent evidence



Criticized as "black-box" evaluations

(Dodds et al., 2013; Sidani & Braden, 1997, Walshe, 2007)

• No post ICU discharge FU service in the study site

The Purposes of the Study

To evaluate the effect of an ICU Follow-up (ICU FU) Programme on the ICU readmission rate and the mortality rate among post-ICU discharge patients with respiratory problem during their first ICU admission as compared to the historical comparison group.

Study design: A quasi-experimental study with a historical control group



The ICU FU Programme : Intervention

- I. Proactive post-ICU discharge follow-up visits
- A revised Modified Early Warning Score with a lower trigger score (MEWS ≥ 3)
- 3. Standardized vital signs monitoring
- 4. Clinical bedside teaching
- 5. Support to the needed upon ward nurses' call NICE clinical guideline 50

The historical control group: NO ICU FU Programme



Study Participants

- ICU patients ready for transfer out to wards
- Inclusion criteria
 - Ist ICU admission
 - ICU stay for ≥ least 24 hours, and
 - Had respiratory problem in form of the following risk factors:
 - Pulmonary problems
 - Use of non-invasive mechanical ventilation
 - ✓ Patient with tracheostomy

• Exclusion Criteria

- Pediatric patients aged < 18 years old
- Patients were transferred to other hospitals or transferred to Cardiac Care Unit of the same hospital directly from ICU

(Timmers et at., 2012; Tam et al., 2014)

ICU Follow-up Programme





Data Collection Period& Outcome Measures

			Intervention group	Control group
	Period (13 months each)		Oct 2015 till Oct 2016	Sep 2014 till Sep 2015
	Number of patients Data collection method		185	184
			Prospective with a structured data collection form, CIS & CMS	Retrospective via CIS & CMS
	Outcomes		Measures	Statistical test
	Primary	ICU hour	readmission within 72	Chi square test/ t-test
	Secondary	All IG Hosp mora	CU readmission bital morality and 90-day ality	(IBM SPSS Statistics Version 24)
	Process	Patie an Vi	ent's satisfaction using sual Analog Scale	Descriptive

Results and Discussion

Baseline Patient Characteristics

Patients	Intervention group (n= 185)	Control group (n=184)	p value
Male (%)	119 (64.3)	125(67.9)	0.464
Mean age (±SD)	64.4 ± 15.5	$\textbf{68.5} \pm \textbf{16.3}$	0.014
APACHE IV score: Mean (±SD)	78.85 (31.75)	86.76 (29.73)	0.014
GCS: Median (IQR)	14 (7-15)	11 (6–15)	0.027
ICU LOS: Mean (±SD)	11.72(10.05)	10.44 (14.86)	0.331
Parent Specialties (%) Medical Non-medical wards	I I 9 (64.3) 66 (35.7)	I I 7 (63.6) 67 (36.4)	0.883
Admission type (%) Non-operation	135 (73)	I40 (76.I)	0.492

Control group : older, higher mean APACHE IV score and lower GCS

Baseline Patient Characteristics

Patients	Intervention group (n= 185)	Control group (n=184)	p value
Disease category (%)			0.003
Sepsis	79 (42.7)	68 (37)	
Neurosurgical/	37 (20)	28 (15.2)	
neurological			
Respiratory	36 (19.5)	24 (13)	
Cardiovascular	II (5. 9)	33 (17.9)	
Gastrointestinal	8 (4.3)	16 (8.7)	
Others	I4 (7.6)	15 (8.2)	
No. of Co-morbidities (%)			0.005
Û Û	159 (85.9)	4 (76.6)	
I	21 (11.4)	42 (22.8)	
2	5 (2.7)	I (0.6)	

Control group : older and having more patients with CVS problems, accounting for comorbidities and higher APACHE IV score

Baseline Patient Characteristics

Patients	Intervention group (n= 185)	Control group (n=184)	p value
Numbers of risk factors (%) I 2 3	62 (33.5) 104 (56.2) 19 (10.3)	74 (40.2) 101 (54.9) 9 (49)	0.097
Risk factors (%) Respiratory rate ≥ 26/min Non-invasive mechanical ventilation Tracheostomy Poor coughing effort /moderate amount of	88 (47.6) 49 (26.5) 76 (41.1) 114 (61.6)	138 (75) 80 (43.5) 41 (22.3) 44 (23.9)	<0.001 0.001 <0.001 <0.001

Different types of risk factors



Outcomes: Early ICU & Total ICU Readmission Rate



Independent Factors to Predict Reduction of Early ICU Readmission by Logistic Regression

Factors	β	Adjusted Odds ratio	95% CI	p value
Intervention	-1.847	0.158	0.041-0.602	0.007
Medical wards	-1.327	0.265	0.095-0.741	0.011
Tracheostomy	-1.622	0.198	0.042-0.927	0.04

ICU FU Programme contributes significantly to early ICU readmission

Reduction of All ICU Readmission

• From 23.9% to 9.7% (p<0.001)

Determinants for successful outcomes

- I. Direct communication
- 2. Direct patient care
- 3. Perceived improved competency in respiratory care
- 4. Perceived increased support from ICU Outreach Team

Outcomes: Hospital Mortality

		Intervention group (n= 185)	o Contro (n=	ol group 84)	p value
Hospital mortality (%) 33 (17.8)		49	(26.6)	0.042	
90-day mortality	(%)	29 (15.7)	42	(22.8)	0.081
Factors		β C	Adjusted Odds ratio	95% CI	p value
Intervention		-0.474	0.622	0.362-1.00	69 0.086

Types and Frequency of Suggested Treatment / Nursing Actions Performed during FU visits

Suggested treatment /nursing actions	I st FU visit	2 nd FU visit	3 rd FU visit
Total FU= 531	(n=183)	(n=174)	(n=170)
Suggested treatment/nursing actions (%) Yes	110 (60.1)	81 (44.3)	63 (34.3)
Types (frequency) Fluid managementMedicationMicrobiology workupManagement of MVBlood testObservationRefer to chest physiotherapyRefer to other allied health servicesPerform tracheal suctionguide tracheostomy managementOptimize patient's positionOthers:	3 7 1 3 1 10 19 0 32 31 19 68	5 1 3 0 2 7 8 1 24 23 8 50	3 2 0 2 3 4 8 0 15 14 7 39
			23

Time and Staff Required for FUVisit

Resources allocation Total FU=531 (81hrs)	l st FU (n=183)	2 nd FU (n=174)	3 rd FU (n=170)	
Total time spent, min (hr)	1836 (30.6)	1576 (26.3)	1403 (23.4)	
Time / visit, (min) Mean \pm SD	10.03 ± 5.54	$\textbf{9.06} \pm \textbf{5.30}$	$\textbf{8.25}\pm\textbf{5.00}$	
Conduct FU visit by (%)				
Nurse Consultant (NC)	91 (49.7)	78 (42.6)	77 (42.1)	
Advanced Practice Nurse (APN)	32 (17.5)	29 (15.8)	28 (15.3)	
ICU doctor	58 (31.7)	66 (36.I)	62 (33.9)	
Estimated net saving of HK\$ 1,135,792 (Reduction of 14 early ICU-readmission)				



Measures to Tackle Challenges

Challenges	Measures	Results
I. Busy ward environment	A4-size poster on top of patient's file for reminder	Ward staff knew what was expected for the programme
2. ICU doctors verbalized embarrassment to FU patient in special care units as there were specialists	Nurse team members were responsible to FU these patients. ICU doctors as back-up	ICU Outreach Team satisfied
3. Lack of equipment/ accessories to support continuity of care	ICU was the last resort to support if there was no other alternatives	Some unit considered to buy e.g. heated humidifier for tracheostomy care



Strengths and Limitations

Strengths

- Theory-driven evaluation
- History threats were addressed

Limitations

- Non-randomized sample allocation
- Social response to questionnaire
- Hawthorn effect

Implication and Recommendations for Nursing Practice



Conclusions: ICU FU Programme

early ICU readmission and total ICU readmission

Highly

recommend the development of ICU FU Programme as an integral part of ICU service in future

patient satisfaction score



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- 4. Nurses of ICU & from collaborative departments
- 5. Partners from Physiotherapy Department





The End



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PY ICU (Post-ICU Discharge Follow-up Care)

(Attach this information sheet to patient's file upon patient's transfer out of ICU)

Recommended frequency of vital signs observation					
Day 0	Day 1	Day 2	Day 3		
On the day of transfer out					
ICU to general ward					
Q4H+prn	QID+ Nocte	QID	Once /shift, or		
			decided by		
			parent team		
			doctor		
	Yes	Yes	Yes		
service					
If patient's MEWS	≥ 3 or patient's co	ondition causes co	ncern_		
+ . + +	+				
	+ +	Call 646004	82		
		(SO Hang Mui, NC	,icu),		
$\left(\left(\mathbf{M} \right) \right)$		ICU Dutreach Team Coord	finator		
		Or Li Siu Chun, APN, II	. /		
		At 64600619			
Ward nurse					
Ward hurse					
Support by ICU team of	doctors				
	d frequency of vital sig Day 0 On the day of transfer out ICU to general ward Q4H+prn service If patient's MEWS: Ward nurse Support by ICU team of	d frequency of vital signs observation Day 0 Day 1 On the day of transfer out ICU to general ward Q4H+prn QID+ Nocte If patient's MEWS≥ 3 or patient's co If patient's MEWS≥ 3 or patient's co Ward nurse Support by ICU team doctors	d frequency of vital signs observation Day 0 Day 1 Day 2 On the day of transfer out ICU to general ward ICU to general ward Q4H+prn QID+ Nocte QID Yes Yes service If patient's MEWS ≥ 3 or patient's condition causes co On the day of transfer out Ward nurse Ves Support by ICU team doctors		



Expected date of implementation

In September 2015