Project Title

BetteR carE for severe community acquired pneumoniaA paTients in Hospital (BREATH)

Project Lead and Members

Project lead: Dr Lew Jin Wen Sennen (Co-lead), Dr Quek Yong Jing Daniel (Co-lead)

Project members: Dr Situ Wangmin Jacqueline, Lionel Ang Wai Jian, Dr Choong Caroline Victoria, Geraldine Ng Li Yuen, Jennifer Guan Huey Chen, Ken Kuo Hong-Ju

Organisation(s) Involved

Tan Tock Seng Hospital

Project Period

Start date: Jul-2018

Completed date: Feb-2019

Aims

Reducing unplanned transfers of patients (for active management) with severe community acquired pneumonia (defined by Pneumonia Severity Index ≥ 4) from General Ward to Intensive Care Unit within 24 hours of admission from the Emergency Department, from 12% to less than 5% in 6 months.

Background

Severe community acquired pneumonia (SCAP) is associated with high mortality (20-50%). It is easy to identify patients with SCAP who require mechanical ventilation/vasopressors in ED. However, it remains challenging to detect more subtle signs of severity. Delayed recognition and start of aggressive treatment, rather than delayed ICU admission, may contribute to additional mortality in SCAP.

Methods

1) Providing guidance on when to perform arterial blood gas (ABG) in pneumonia patients. Recommendation to check PaO2/FiO2 ratio for all patients with pneumonia, with the use of a SPO2/PO2 conversion table for FiO2 < 0.35 and ABG for patients requiring FiO2 $\geqslant$ 0.35. Visual aids were placed around Emergency Department and education done at appropriate forums (e.g. department Mortality and Morbidity rounds). Agreement with Medical Intensive Care Unit (MICU) to consider admission to High Dependency/ICU for patients with PaO2/FiO2 ratio < 250.

2) Improving accuracy of existing scoring system [Pneumonia Severity Index (PSI)] in Emergency Department. Use of information technology solutions by triggering an auto-pop up when new information (e.g. laboratory results) altered score of PSI. Agreement with Medical Intensive Care Unit (MICU) to consider admission to High Dependency/ICU for patients with PSI 4/5

Results

The median percentage of patients with severe community acquired pneumonia who had unplanned transfers from the general ward to the intensive care unit was 12% pre-intervention compared to 0% post-intervention.

Lessons Learnt

Such an undertaking is a multidisciplinary effort and requires interdepartmental and indeed interdivisional cooperation.

A lot of interpersonal communication is required, including going down to the ED shop floor and speaking to individual staff personally about the implementation of new protocols.

It is interesting that just by tweaking the workflow slightly (in terms of IT system solutions and some education for colleagues) can result in a large magnitude of effect.

The ability to recognize acute illness clinically is inherently prone to failure and clinical judgement should be backed up with objective scientific data.

Human factors must be addressed in order to successfully achieve an improvement in process measures.

Conclusion

Increasing the objectivity of assessment of severity of pneumonia patients, with the aid of clear guidelines, education and information technology solutions, helped reduced the number of unplanned transfers from general ward to the intensive care unit. The estimated cost savings per annum is SGD72 000.

Additional Information

Recipient of the 2019 NHG Quality Improvement Award - Building Strong Partnerships in Improvement Work (Merit Award)

Project Category

Clinical Improvement, Safe Care

Keywords

Clinical Improvement, Safe Care, Cost Savings, Multi-Disciplinary Care, Emergency Medicine, Respiratory and Critical Care Medicine, General Medicine, Intensive Care Medicine, Tan Tock Seng Hospital, Unplanned Transfer, Severe Community Acquired Pneumonia, Cause and Effect Diagram, Pareto Chart

Name and Email of Project Contact Person(s)

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BETTER CARE FOR SEVERE COMMUNITY ACQUIRED PNEUMONIAA PATIENTS IN HOSPITAL (BREATH)

Dr Sennen Lew Jin Wen, Respiratory & Critical Care Medicine
Dr Daniel Quek Yong Jing, Emergency Medicine

Tan Tock Seng Hospital, National Healthcare Group

National Healthcare Group — Adding years of healthy life

Mission Statement

Reducing unplanned transfers of patients* with severe community acquired pneumonia# from General Ward to Intensive Care Unit within 24 hours of admission from the Emergency Department, from 12% to less than 5% in 6 months
* for active management
# defined by PSI (class ≥ 4)

Team Members

|	Name	Designation	Department
Team Leaders	Dr Sennen Lew Jin Wen	Senior Consultant	RCCM
	Dr Daniel Quek Yong Jing	Associate Consultant	Emergency Medicine
Team Members	Dr Situ Wangmin Jacqueline	Senior Resident	Emergency Medicine
	Lionel Ang Wai Jian	Senior Staff Nurse	Emergency Medicine
	Dr Caroline Choong	Senior Resident	RCCM
	Geraldine Ng Li Yuen	Advanced Practice Nurse	General Medicine
	Jennifer Guan Huey Chen	Senior Resident	General Medicine
	Ken Kuo Hong-Ju	Respiratory Therapist	Respiratory Therapy

RCCM = Respiratory and Critical Care Medicine

Evidence for a Problem Worth Solving

- Overall burden of pneumonia in TTSH - 5246 patients diagnosed with pneumonia/chest infection in ED in 2016. 4674 Jan-Oct 2017 (estimated 2% increase over same period) Source: EDWeb
- 24 hour audits (ED) - 43 patients for which transfer may be "attributable" to ED/Inpatient team, 2015-mid 2017 Source: ED 24-Hour transfer audits
- Approximately 36% of Severe CAP patients are initially sited in the ward before transfer to MICU.

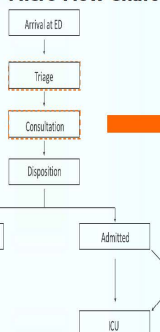## Evidence for a Problem Worth Solving

MICU/HD Data

Cost of Care (SGD)
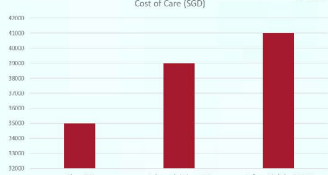
Financial Impact

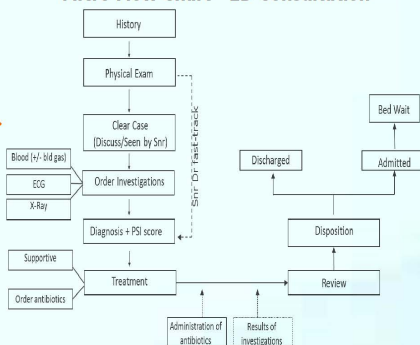|	Direct ICU Admission	Delayed Admission <24H	Delayed Admission 24H-72H
ICU LOS	11.6	14.7	28.3
H LOS	22.7	28.4	38.5

Length of Stay

Flow Chart of Process

Micro Flow Chart

Micro Flow Chart - ED Consultation

Cause and Effect Diagram

Pareto Chart

Unplanned Transfers to ICU

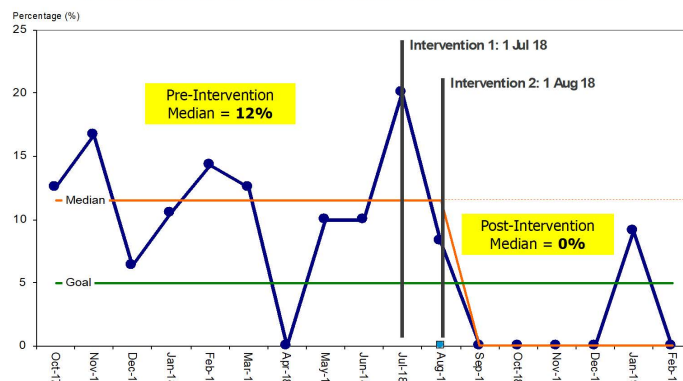| Cause A	No guidance when to do blood gas
Cause B	Inaccurate PSI scoring
Cause C	Heterogenous care
Cause D	Inadequacy/inaccuracy of vital signs monitoring
Cause E	Lack of ownership of patient
Cause F	Lack of validated scores
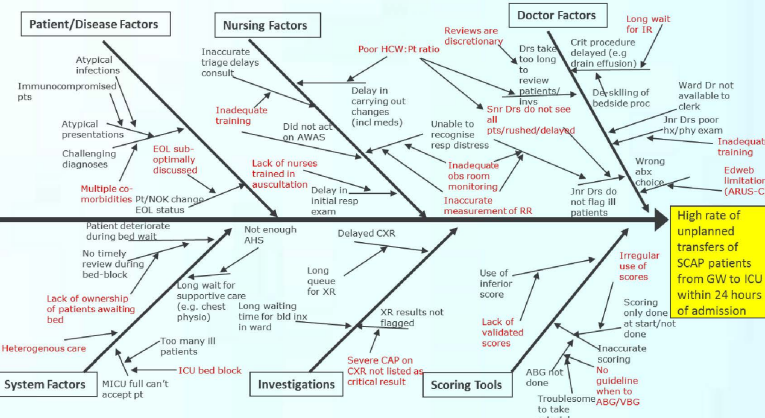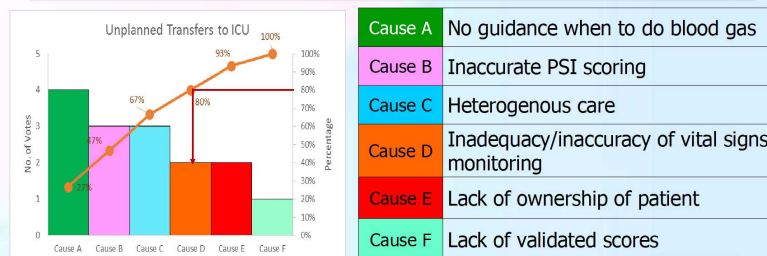
Implementation

CAUSE / PROBLEM (refer to Pareto Chart)	INTERVENTION	DATE OF IMPLEMENTATION
No clear guidance as to when to perform ABG in a pneumonia patient	Calculate PaO2/FiO2 ratio for all patients with PNEUMONIA	1 Jul 2018
	ABG for patients (active management) requiring FiO2 ≥ 0.35	
	Consider HD/ICU if PaO2/FiO2 < 250	
Inaccurate PSI scoring	Score PSI prior to disposition	1 Aug 2018
	Consider HD/ICU if PSI 4/5	

Results

Percentage of Severe Community Acquired Pneumonia Admissions to MICU which were initially sited in the General Ward within 24 Hours of Admission from the ED

Intervention 1: 1 Jul 18
Intervention 2: 1 Aug 18
Pre-Intervention Median = 12%
Post-Intervention Median = 0%

Cost Savings

- No of MICU Admissions per annum = 750
- Average Severe CAP admissions meeting intervention criteria per annum = 150 X 12% = 18
- Average cost saving per case = SGD 4000
- Net cost savings by reducing wrong siting of cases to 0% = SGD 4000 X 18 = **SGD 72 000**

Lessons Learnt

- Such an undertaking is a multidisciplinary effort and requires interdepartmental and indeed interdivisional cooperation
- A lot of interpersonal communication is required, including going down to the shop floor and speaking to individual staff personally about the implementation of new protocols.
- It is interesting that just by tweaking the workflow slightly (in terms of IT system solutions and some education for colleagues) can result in such a magnitude of effect.
- The ability to recognize acute illness clinically is inherently prone to failure and clinical judgement should be backed up with objective scientific data.
- Human factors must be addressed in order to successfully achieve an improvement in process measures.

Strategies to Sustain

- Changes in the IT solution will ensure that there is appropriate assessment of the PSI score which will ensure right siting.
- Heightened awareness of acute / critical illness in the ED and on the part of the Registrars covering MICU should be sustained by reminders at ED M&M meetings Division of Medicine Meetings.