

Early Identification, Investigation and Intervention of Sepsis In-Patients – Results of a Pilot Study

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Authors:

Doris Bohl, RN BSN, Dr. Vandad Yousefi, MD, CCFP, FHM
and Jenifer Tabamo, RN, BSN, MSN

Oral Presentation: The authors would also like to submit this abstract for consideration for the Oral Presentation during the QI Pre-conference course

Contact Person:

Doris Bohl
3926 Southwood Street
Burnaby BC V5J 2E4
Canada
Phone: 604.809.1279
Fax: 604.875.5763
Email: doris.bohl@vch.ca

Background:

Early recognition and intervention of sepsis improves patient outcomes. Despite this, there is still a gap between early identification of patients who are clinically deteriorating and timely investigation and treatment¹. At our institution, a retrospective chart audit of 30 patients admitted to a 24-bed medical unit revealed gaps in timely recognition of patients with sepsis, leading to delays in initiation of various components of guideline-based treatment. The chart review also revealed gaps in the documentation of care processes which limited extraction of meaningful performance data. In collaboration with the British Columbia Patient Safety & Quality Council (BCPSQC), a quality improvement team at Vancouver General Hospital (VGH) initiated a pilot project in the hospitalist led 24 bed medical unit, for early recognition, investigation and treatment of sepsis for admitted medical patients.

Project Aim:

1. To standardize the care of admitted patients developing early sepsis through:
 - a. Implementing a nurse led Sepsis Screening Tool designed to facilitate early recognition of septic patients
 - b. Piloting a new Early Sepsis Investigation and Treatment for In-Patient Pre-Printed Orders for use by hospitalists

Methods:

The hospitalist led acute care medical unit at Vancouver General Hospital (VGH) is a 24 bed unit with patients primarily being admitted from the Emergency Department. The unit is exclusively staffed by VGH hospitalists who rotate through on a regular basis. Since the ward is not a formal clinical teaching unit, there is no significant turn over of medical trainees. In addition the unit has a dedicated nursing and allied workforce with low staff turn over. The average length of stay of patients is 10 days with majority of patients age 70 years and greater.

Under the direction of a physician Clinical Leader for Sepsis, a local quality improvement team² was created, that included a clinical nurse specialist, medical resident, hospitalist, critical care nurses and a nurse educator who significantly contributed to the project. The project was also supported by the medicine program operations leader. The pilot study was initiated as part of a larger province-wide collaborative facilitated by the British Columbia Patient Safety and Quality Council (BCPSQC) to enhance sepsis improvement activities in B.C.

The quality improvement (QI) team used the BC Adult In-Patient Sepsis Screening Tool (figure 1) and developed an associated Early Sepsis Investigation and Treatment Pre-Printed Orders set (figure 2). These tools were implemented over a number of phases on the pilot unit using

¹ "BC Patient Safety & Quality Council." *BC Patient Safety Quality Council*. N.p., n.d. Web. 18 Aug. 2015. <<https://bcpsqc.ca/clinical-improvement/sepsis/bc-sepsis-network/>>.

² QI Members: Alison Beaty RN BSN, Doris Bohl RN BSN, Leighanne MacKenzie RN BSN MA, Dr. Julian MacKenzie-Feder MDCM PGY4 CCM UBC, Suzanne Miller RN BSN, Dr. David Sweet MD FRCP (C), Jenifer Tabamo RN BSN MSN, Dr. Vandad Yousefi, MD CCFP FHM

established quality improvement methodologies such as Plan-Do-Study-Act (PDSA) cycles, as well as educational seminars, inservice sessions, staff surveys and chart audits.

Phase 1: Introduction and Implementation (Sep. 1 – October 31, 2014)

During phase 1, the majority of the regular nursing staff received a review of the Systemic Inflammatory Response Syndrome (SIRS) Criteria , and education on both the Sepsis Screening Tool and the draft Pre-Printed Order set. The tools were introduced to the hospitalist group at their monthly meeting for feedback and suggestions. The nursing staff were instructed to contact the attending hospitalist for every patient that had any two of the SIRS Criteria listed in the Sepsis Screening Tool, and to receive orders to start the Pre-Printed Orders (PPO).

The early sepsis pilot QI project was officially launched on October 31. Audits of patients identified to have sepsis were conducted throughout the project. “Missed cases” were identified as those patients with clinical signs of SIRS and whom the nursing staff did not recognize as potentially septic. Patients who were properly identified were divided into two groups: those for whom the Sepsis PPO was initiated by the attending hospitalist, and those for those whom treatment was initiated without the PPO.

Phase 2: Audits and modifications (December 2014- ongoing)

During this phase, the project tools were revised and refined based on feedback received from the nursing staff and hospitalists, as well as from results of chart audits and review of metrics. To date, two PDSA cycles have been completed:

First PDSA cycle: At the onset of the project, hospitalists preferred to either write or give verbal orders for interventions. The QI team met with the group to identify strategies that could facilitate use of the order set. Feedback from the group showed a preference towards more designated default options for investigations and basic treatments. Concurrently, the Professional Nursing Practice Director confirmed that nurses were able to take verbal confirmation from hospitalists to implement the PPO without formal requirement for physician signature on the pre-printed order set.

From March to April 2015, the QI team also, surveyed the unit nursing staff, on their perspectives of the Sepsis Screening Tool and the PPO. Since early identification of sepsis symptoms by the nursing was crucial for timely implementation of the PPO, nurses were reminded of SIRS symptoms through a number of educational modalities (posters, unit meetings and electronic communication). Furthermore, small gift incentives were awarded to all individuals who identified septic patients and contacted the attending hospitalist.

Second PDSA cycle: During the second cycle, the PPO was further revised based on feedback from stakeholders. This resulted in a simplified order set, with appropriate laboratory and imaging investigations as default options and clearer instructions for patient monitoring by nursing.

Results:

Figure 3 summarizes the data collected from patients who developed new sepsis symptoms on the pilot unit.

From October 31, 2014 to August 10, 2015, 24 patients were identified to have developed sepsis. In 15 of these patients, early sepsis symptoms were recognized by the nursing staff and the Early Sepsis Investigation and Treatment Pre-Printed Orders were implemented, “Identified and PPO Used”. These 15 patients consistently underwent investigations (imaging, lactate measurements, blood cultures, urine and sputum specimens) with timely intravenous fluid and antibiotic treatment (Figure 4).

In four patients, early signs of sepsis were identified, but the PPO was not used, “Identified but no PPO used”. Despite small numbers, we identified a number of gaps in ordering investigations as well as delay in initiation of intravenous fluids and obtaining bloodwork (Figure 4).

Five patients who displayed early sepsis symptoms were identified as “Missed Cases”. In these instances, the nursing staff recorded vital signs, which showed patients met at least 2 of 5 SIRS symptoms, but the hospitalist was not contacted in a timely manner. The average time to contact the hospitalist after the initial recorded SIRS symptoms was 11.5 hours (Figure 4).

The nursing staff survey revealed generally positive engagement of frontline clinicians and positive attitude towards the use of the project tools. Specifically, the majority of respondents found the Sepsis Screening Tool and the associated PPO easy to understand and use (Figure 5).

Finally, 23 out of 24 of the sepsis patients were transferred to lower levels of care or discharged home. Only one patient went to a higher level of care suggesting early sepsis identification and use of a standard PPO may have decrease patient transfer to a Critical Care Unit.

Conclusions:

- Collaborative care between hospitalist and nursing is essential to early recognition, treatment and improved outcomes for patients who develop sepsis on medical units.
- Nursing Leadership is important in supporting front line nurses in increasing competency of sepsis screening and assessment through creation of a no-blame environment and allowing for extensive educational opportunities.
- A standardized pre-printed order set can facilitate timely and consistent medical investigations and treatment of patients who develop sepsis in the hospital.
- The Sepsis Screening Tool appears to have reasonable sensitivity in identifying potential patients with sepsis. Feedback from hospitalists suggests that the number of calls made to them has not substantially increased as a result of the screening tool, and the majority of calls made appear to be appropriate.
- There is a trend towards shorter time from nurses identifying sepsis symptoms to contacting the hospitalist over the course of the project.
- There is evidence for more consistent investigations and treatments when the PPO is initiated (Figure 4):

- lactate levels were consistently drawn
- blood cultures were taken prior to antibiotic administration
- patients received intravenous fluids and antibiotic therapy within 30 minutes to 3 hours of physician ordering
- Implementation of both the Sepsis Screening Tool and the associated PPO has allowed for improved quality and safety of patients with early sepsis symptoms.

Future Directions:

The project team continues to monitor progress on the pilot unit and measure performance rates. The team is currently working on spreading the project to other units, and has targetted another hospitalist ward for expansion of the project.

Figure 1: BC Adult Inpatient Sepsis Screening Tool

BC Adult Inpatient Sepsis Screening Tool

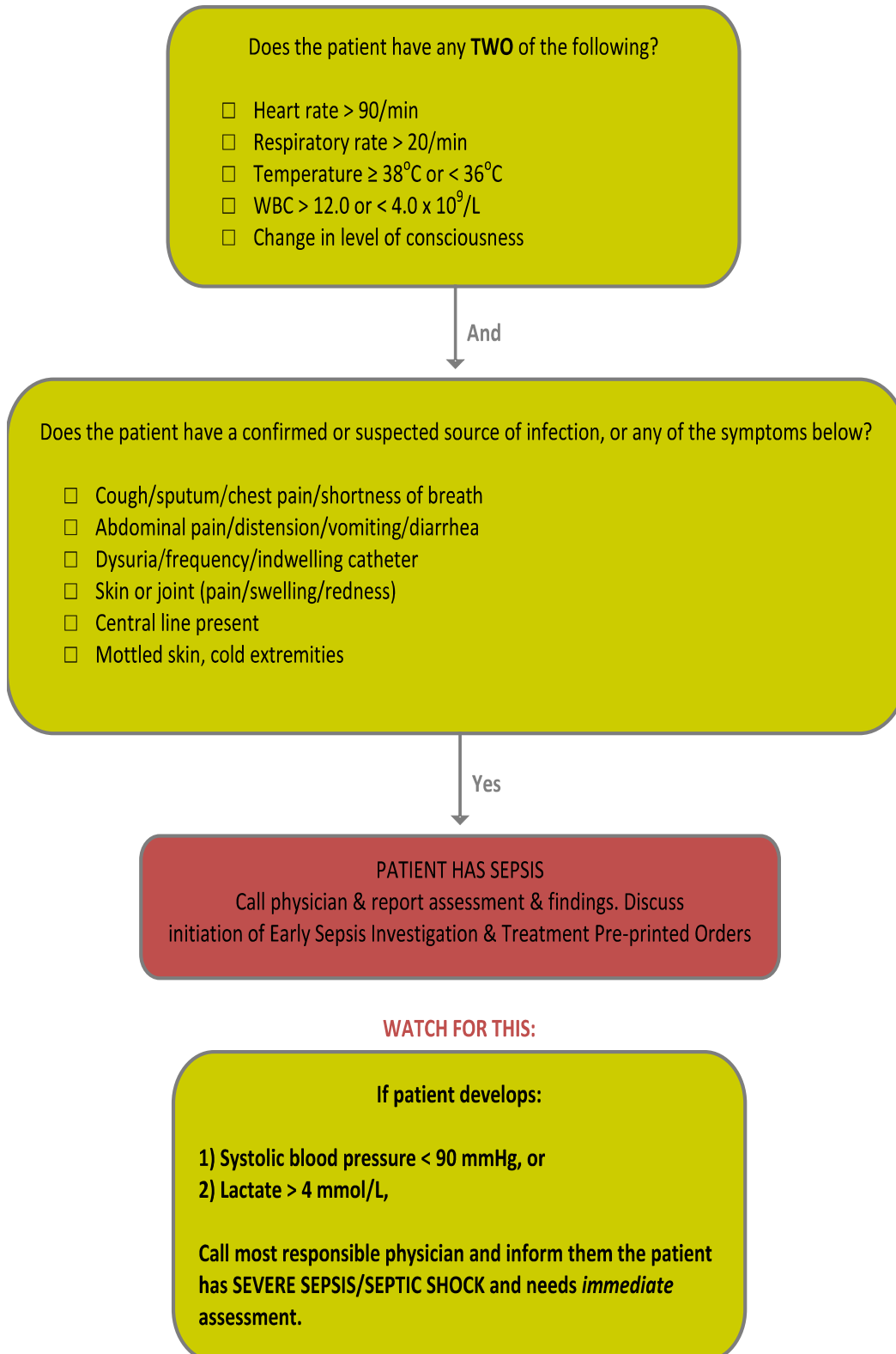


Figure 2: Early Sepsis Investigation and Treatment Orders Inpatient Pre-Printed Orders


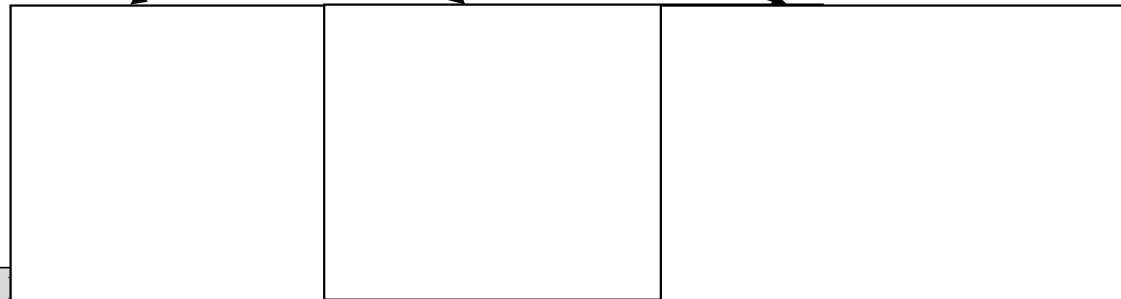
IF YOU RECEIVED THIS FACSIMILE IN ERROR, PLEASE CALL 604-875-4077 IMMEDIATELY		
 VA: VGH / UBCH <h3 style="text-align:center;">ORDERS</h3>	<h1 style="font-size: 2em; color: #ccc;">***DRAFT***</h1> <p>DATE _____</p> <p>ADDRESSOGRAPH _____</p>	
COMPLETE OR REVIEW ALLERGY STATUS PRIOR TO WRITING ORDERS		
EARLY SEPSIS INVESTIGATION & TREATMENT ORDERS: IN-PATIENT(CP 10D) WARD		
(items with check boxes must be selected to be ordered)		(Page 1 of 1)
Date: _____ Time: _____	Time Processed RN/LPN Initials Comments	
<div style="border: 1px solid black; padding: 5px;"> <p>** Confirm Early Sepsis Investigation and Treatment is congruent with patient's goals of care **</p> <p style="text-align:center;">URGENT CONSIDERATIONS</p> <p>If patient develops hypotension (SBP less than 90 mmHg) despite initial fluid bolus, or lactate greater than 4 mmol/L, not explained by existing condition, notify physician that SEVERE SEPSIS/SEPTIC SHOCK may be present and call Critical Care Outreach Team (CCOT). Physician to consider ICU consultation</p> <p>If drainable focus of infection identified, organize early source control/drainage Physician to determine further management and disposition</p> </div>		
<p>DIET: <input type="checkbox"/> NPO x 24 hours and reassess</p>		
<p>LABORATORY: All investigations are STAT</p> <p>Lactate (Venous Plasma). Notify physician immediately if lactate greater than 2 mmol/L</p> <p><input type="checkbox"/> Repeat lactate 2 hours after the first lactate is drawn. Notify physician of results</p> <p>CBC and differential, INR, PTT, electrolytes, BUN, creatinine, glucose, liver function tests, lipase, troponin</p> <p>Blood cultures X 2 sets BEFORE antibiotics (include culture from central line, if present)</p> <p><input type="checkbox"/> Urinalysis and urine C&S (as per VCH guidelines)</p> <p><input type="checkbox"/> Sputum for C&S</p> <p>Other _____</p>		
<p>DIAGNOSTIC: All investigations are STAT</p> <p><input type="checkbox"/> 12 lead ECG</p> <p><input type="checkbox"/> Chest X-ray</p> <p>Other _____</p>		
<p>INTRAVENOUS:</p> <p>Initial intravenous infusion and hydration orders:</p> <p>Ensure at least #20 gauge IV access is in place. May insert a second IV access as necessary.</p> <p><input type="checkbox"/> Start IV bolus: <input type="checkbox"/> Ringer's Lactate _____ mL (max 2 L)</p> <p> <input type="checkbox"/> sodium chloride 0.9% (NS) _____ mL (max 2 L)</p> <p> <input type="checkbox"/> Plasmalyte _____ mL (max 2 L)</p> <p>Give IV fluid over _____ minutes (physician to assess post-bolus)</p>		
<p>MEDICATIONS:</p> <p><input type="checkbox"/> Physician to initiate appropriate antibiotic therapy</p> <p>_____</p> <p>_____</p>		
<p>MONITORING:</p> <p>Vital Signs and oxygen saturation Q1H X 6H</p> <p>Glasgow Coma Score (GCS) Q1H X 6 H</p> <p>Monitor urine output if able – May insert a foley catheter as necessary.</p>		
<p>TREATMENTS:</p> <p>Supplemental O₂ to maintain oxygen saturation greater than 92%. Page RT if requires high flow O₂</p>		
xxx _____ Prescriber's Signature xxxxx	_____ Printed Name VCH.VA.PPO.XXX I SEPT.2014	_____ College ID

Figure 3: Summary of patients who developed sepsis

Baseline Characteristics n=24	
Age, median (range)	86 years (31-93 years)
Age, average	78.4 years
Male, sex %	60%
Inclusion Criteria	New onset sepsis symptoms
Inpatient Sepsis Source n=24	
Urosepsis	n=11
Pneumonia	n=7
Bacteremia	n=2
Pyelonephritis	n=1
Colitis	n=1
Unknown	n=3

Figure 4: Flow Diagram

Patients with Sepsis n=24

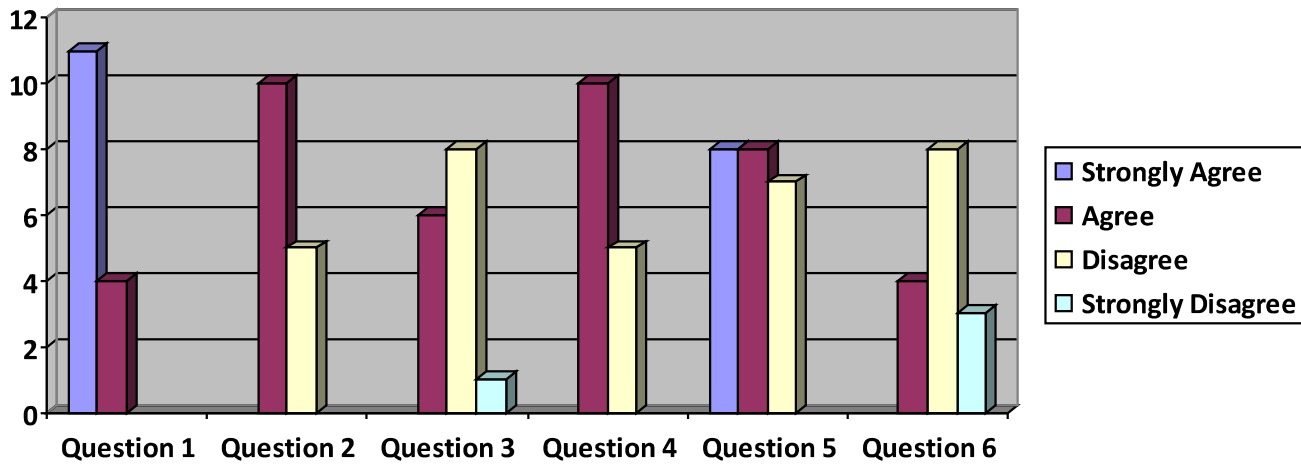


Values based on documentation of initial SIRS symptoms		PPO	
% Lactate Ordered	100	50	20
% Blood cultures ordered	73	25	20
% IV Fluids ordered	73	100	40
% Antibiotics ordered	93	75	100 ⁵
% BC done before antibiotics	100	25	20
Average time to call doctor	17 min	Unknown ⁶	11.5 hours
Average time for doctor to return call	15 min	Unknown ⁴	15 min
Time to obtain lactate specimen	49 min (average) Range: 20-150 min	20 min (average) Range: 1-40 min n=2	8 hours Range: 8 hours n=1
Time to obtain blood cultures	40 min (average) Range: 20-90 min	2.5 hours Range 1-4 hours	12 hours Range: 9-15 hours
Time to initiate fluids	23 min (average) Range: 1-80 min	105 min Range: 30-180 min	9 hours Range 8-10 hours
Time to administer first dose antibiotics	55 min (average) Range: 10-150 min	Unknown ⁴	12.3 hours Range 9-18 hours

⁵ Due to acuity, all patients received antibiotic therapy

⁶ Unable to determine due to missing data

Figure 5 : Survey of Nursing Perception of the Screening Tool and Early Investigation and Treatment Pre-Printed Orders n=15



Question 1. The draft screening tool is easy to understand.

Question 2. The draft screening tool is helping clinicians to identify sepsis.

Question 3. Feedback from clinicians has been positive for the screening tool.

Question 4. The draft early investigation and treatment orders are easy to understand.

Question 5. The draft early investigation and treatment orders are helping clinicians to identify and treat sepsis.

Question 6. Feedback from clinicians has been positive for the early investigation and treatment orders.