Impact of a Nurse-Driven Sepsis Screening Protocol on Incidence of Sever Sepsis in Patients Managed by a Hematology-Oncology Ambulatory Clinic

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1 Background

- Severe sepsis occurs in 14-45% of patients with cancer admitted for infection.
- This retrospective analysis showed 45% of patients screened positive for sepsis, but only 8.4% had confirmed infection.
- Existing studies on international sepsis guidelines exclude cancer patients from evaluation (Claessans et al, 2013)

2 Objectives

Evaluate feasibility and efficacy of a nurse-driven sepsis protocol in an hematology-oncology ambulatory clinic.

- Baseline demographic and adherence to sepsis best practices in patients with infection admitted from clinic.
- Evaluate applicability of international screening criteria within this population and adjust as needed.
- Compare incidence of adverse outcomes in patients before and after protocol implementation.
- Evaluate fidelity of protocol

3 Methods

- Phase I: Baseline data in randomly selected patients (n=38) admitted for possible infection (7/2012-3/2013)
- Phase II: Protocol implementation
  - Nurse-initiated screening
  - Nurse-activated standing orders
  - Clinician-support algorithm
- Phase III: Evaluate protocol fidelity and applicability of international sepsis screening criteria (n=79) (4/2014-5/2014)
- Phase IV: Utilize data and evidence-based literature to develop oncology-specific sepsis screening criteria
- Phase V: Compare incidence of adverse outcomes at baseline and after protocol implementation; verify protocol maintenance (7/2014-4/2015)
  - Randomly selected patients (n=40) admitted for possible infection
  - Re-examine adverse patient outcomes

4 Results

- Phase I- Baseline adherence to the protocol was 0%; Lactate drawn in 1/38 patients.
- Phase II/ III- protocol adherence was 82.5%; no missed cases of sepsis
- Phase IV- Revised screening criteria developed

Johns Hopkins Oncology Revised Sepsis Screening Criteria

Parameter	Surviving sepsis	JHH
Temperature (T)	T< 36.0C or > 38.3C	T < 35.5C (without symptoms) or >38.0C [1,2,3]
Heart rate (HR)	HR > 90/min	HR > 100/min[3,4]
Respirations (RR)	RR > 20/min	RR > 20/min
Blood pressure (BP)	Systolic BP < 90 mm or> 40 mm drop from baseline, OR MAP < 65 mm	Systolic BP < 90 mm or> 40 mm drop from baseline, OR MAP < 65 mm
WBC	< 4000/mm3 or > 12,000/mm3, or > 10% bands	< 4000/mm3 or > 12,000/mm3, or > 10% bands, neutropenia[1,4]
Other	None	Glucose > 140 mg/dl in absence of diabetes[2,5] Altered mental status[2,4,5,6] Mottling[4,5,6]

[1] Badon et al, 2016 [2] Shelton et al, 2016 [3] Hanzelka et al, 2013 [4] Cooksley et al, 2012 [5] Dellinger, 2012 [6] Singer et al, 2016

Sources Oncology-specific criteria: *Hanzelka et al, 2013; Shelton et al, 2016*

- Phase V- Comparison of Adverse Outcomes before and after protocol implementation

Baseline and Post-protocol group comparisons

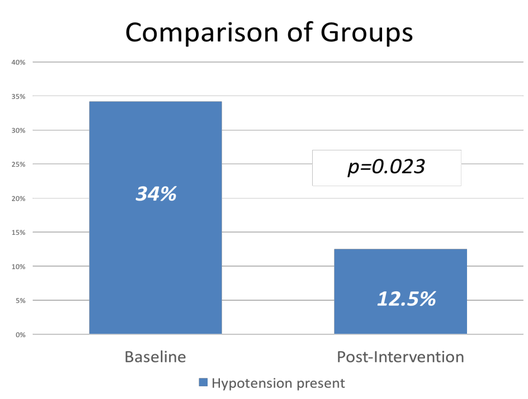
Variables	Comparison Group (SD/%) N = 38	Post-intervention Group (SD/%) N = 40
Gender (Male)	23 (60%)	27 (67.5%)
Age (years)	Mean 52.0 (SD 15.3) Range 21-75	Mean 51.3 (SD 13.8) Range 21-75
Diagnoses	Multiple myeloma 5 (13.2%) Acute leukemia/ MDS 17 (44.7%) Chronic Leukemia 1 (2.6%) Lymphoma 13 (34.2%) Heme disorders/ other 2 (5.3%)	Multiple myeloma 5 (12.5%) Acute leukemia/ MDS 26 (65%) Chronic Leukemia 1 (2.5%) Lymphoma 6 (15%0 Heme disorders/ other 2 (5%)
Treatment	Chemotherapy 13 (34.2%) Autologous transplant 6 (15.8%) Allogeneic transplant: • myeloablative 16 (42.1%) • non-myeloablative 3 (7.9%)	Chemotherapy 15 (37.5%) Autologous transplant 4 (10%) Allogeneic transplant: • myeloablative 18 (45%) • non-myeloablative 3 (7.5%)
Steroids*	**3 (7.9%)**	**12 (30%)**
Mucositis ≥2	7 (18.4%)	11 (27.5%)
Presenting Symptoms	URI- 11 (28.9%) Pneum-2 (5.3%) UTI- 3 (7.9%) GI- 16 (42.1%) No symptoms- 13 (34.2%)	URI- 8 (20%) Pneum-6 (15%) UTI- 2 (5%) GI- 19 (47.5%) No symptoms- 16 (40%)
Outpatient antibiotics	12 (31.6%)	14 (35%)
Central Line present	**38 (100%)**	**35 (87.5%)**
Infection source identified	17 (45.9%)	20 (50%)
Low temp presenting SIRS	3 (7.9%)	2 (5%)
High temp presenting SIRS	**13 (34.2%)**	**25 (62.5%)**
Hypoxia within 24 hr	0 (0%)	3 (7.5%)
Severe sepsis at 24 hr	16 (42.1%)	14 (35%)

Bolded values statistically significant differences between groups (Independent samples T-test/ Chi-square) p = <.05
** Variations in clinical protocols and stage of treatment may have resulted in altered risks and symptoms in post-implementation group*
***Post-implementation group had less neutropenia*
SIRS = systemic inflammatory response symptoms identified by sepsis screening criteria

Statistically Significant Findings

Key Findings	Comparison N = 38	Post-intervention N = 40	Difference	Significance*
Hypotension within 24 hours	13 (34.2%)	5 (12.5%)	21.7%	p= 0.023
# SIRS at onset/admission	Mean 2.74	Mean 3.70	-0.963	P=0.002
# SIRS at 24 hours	Mean 3.82	Mean 2.98	0.841	P=0.000

**Dichotomous variables- Chi square p = significance based upon Fisher's exact test*
**Continuous variables Independent sample T-test- p = significance with inequality of means*



5 Conclusions

- Standards for early detection and management of sepsis can be successfully implemented in the oncology ambulatory setting.
- Implementing a nurse initiated sepsis protocol in oncology is feasible and has the potential to positively influence outcomes.
- Oncology-specific sepsis screening criteria can reduce false screen positives without missing cases of true sepsis.
- Early detection of sepsis is related to higher number of SIRS criteria at onset, but less severe consequences such as hypotension and organ failure.

6 Future Directions

- Oncology-specific screening criteria need to be evaluated for sensitivity and specificity in a powered study.
- Modified sepsis screening criteria may reduce work associated with sepsis screening and evaluation without missing true sepsis patients.
- Evaluate SOFA/qSOFA guidelines for specificity and sensitivity in oncology populations

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Selected References

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