MASCC Risk Index as a Sepsis Screening Tool in Cancer Patients

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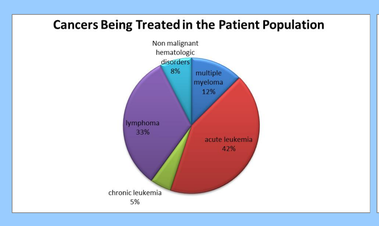
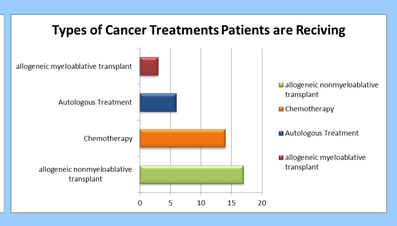
1 Background

The Multinational Association for Supportive Care in Cancer (MASCC) risk index was initially developed in 2000 to assess low risk cancer patients with febrile neutropenia who may be candidates for outpatient antimicrobial management[7]. Subsequent studies have also validated its' predictive value for febrile neutropenic patients at high risk for poor outcomes such as severe sepsis and septic shock[1,3,4,8,9,10,11]. The majority of studies included patients with solid tumors who received recent chemotherapy and experienced a short duration of neutropenia[4]. Six out of 12 studies included 370 out of 933 (39.657%) total patients with hematologic malignancies, and none of the studies defined patients undergoing hematopoietic stem cell transplantation (HSCT) or having infections after failure to engraft the transplanted marrow or loss of their bone marrow graft[1,2,5,6,7,12]. According to the American Society of Clinical Oncology (ASCO), MASCC scores should be used to identify sicker patients with febrile neutropenia who are candidates for hospital admission with intravenous antibiotics[4]. Research validates that patients exhibiting symptoms of sepsis, severe sepsis, and septic shock may not always be febrile, and this symptom may not be present in HSCT patients receiving immunosuppressive medications[4]. This quality improvement project implemented sepsis best practice guidelines in an ambulatory clinic caring for patients with hematologic malignancies and collected MASCC scores for all patients meeting sepsis screening criteria. Secondary analysis of MASCC scores from this QI project provides descriptive data about the application of this scoring index in a specialized population

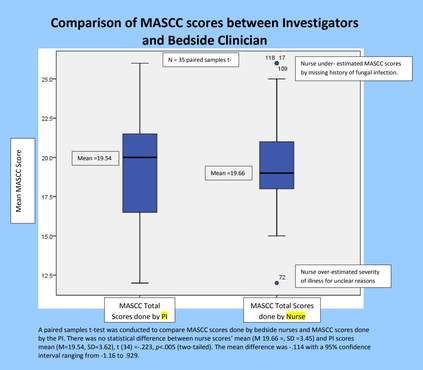
2 Methods

This quality improvement project implemented an interprofessional clinical practice protocol for sepsis management. Seventy-nine (79) patient encounters meeting sepsis criteria were prospectively evaluated and compared to forty (40) comparison patients who were admitted to the hospital with possible infection between July 2012 and March 2013.





MASCC scores were not routinely performed in the comparison population and were incomplete in the post-protocol implementation group. Investigators (PI) reviewed the electronic medical record and utilized clinical data to calculate MASCC scores for all patients. The staff generated MASCC scores and PI generated MASCC scores were examined for accuracy and inter-rater reliability using a paired T-test which showed no significant difference in scoring.



A paired samples t-test was conducted to compare MASCC scores done by bedside nurses and MASCC scores done by the PI. There was no statistical difference between nurse scores' mean (M 19.66 +- SD =3.45) and PI scores mean (M=19.54, SD=3.62), t (34) =-.223, *p*<.005 (two-tailed). The mean difference was -.114 with a 95% confidence interval ranging from -1.16 to .929.

The MASCC score includes variables that predict for severity of illness. Points are given when there is an absence of a risk factor, and not allocated when a risk factor is present.

Table 1: Multinational Association for Supportive Care in Cancer (MASCC) Risk Index Scoring System for Febrile Neutropenic Patients with Cancer[a]

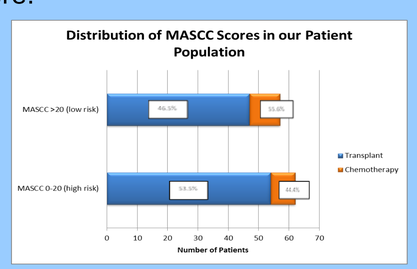
Risk Characteristic	Points
Burden of febrile neutropenia	
- No or mild symptoms	5
- Moderate symptoms	4
No hypotension	5
No chronic obstructive pulmonary disease	4
Solid tumor or hematologic malignancy with no previous fungal infection	4
Outpatient status	3
No dehydration requiring parenteral fluids	3
Age < 60 years	2

[a]Cumulative point score of 21 or more defines a low-risk patient. The maximum theoretical score is 26. Adapted with permission from Klastersky J, et al.[a] Copyright © 2000 by the American Society of Clinical Oncology. All rights reserved.

The MASCC score has been studied as:

- Total score
- Two category risk score (>20 = low risk or 0-20 = high risk)
- Three category risk score (21-26 = low risk, 15-20 = high risk, and 0-14 = very high risk).

This sample was moderate in size, and lacked sufficient numbers of very high risk category patients to permit statistical review. Consequently, two category MASCC scores were used for analysis. The distribution of MASCC scores for this population were:



The MASCC score was originally developed for use with febrile neutropenic patients, but this quality improvement project applied the score in patients screening positive for sepsis using international criteria. Analysis of only febrile patients was not possible given that only 19/119 (15.9%) patients were febrile.

3 Results

Relationships between MASCC Scores and Infection-Related Characteristics

Variable	*p* value (one sample two tailed t-test)
Mean MASCC scores significantly lower in Transplant Patients	*0.000 Pearson r = -.058
Mean MASCC 0-20 (high risk) correlated to greater number of SIRS at 24 hours	*0.000 Pearson r = .116
A higher mean temperature correlated to higher HR	*0.000 Pearson r = .186

-MASCC score did not correlate to: Presence of bacteremia, positive source of infection

-Data was insufficient for analysis: Hospitalized within 24 hours, 7 days, alive at discharge

*Statistical significance is *p* <.05 Pearson r = 1.0 is strong relationship, < 1.0 weaker relationship

Variable	*p* value (Chi Square Fisher's Exact Test)
MASCC 0-20 (high risk) correlated to presence of severe sepsis at 24 hrs.	*0.029 Phi=.206, Sig.=.025
MASCC 0-20 (high risk) correlated with hypotension within 6 hrs.	*0.004 Phi=.281, Sig.=.002
MASCC 0-20 (high risk) associated with HR ≥ 100/min	*0.028 Phi= .215, Sig. = 0.02
MASCC 0-20 (high risk) associated with non-myeloablative transplant therapy	*0.023 Phi = .224, Sig. 0.015

*Statistical significance is *p* <.05

Phi: 0.1 = low strength of association, 0.3= moderate strength of association, >.049 = high strength of association

4 Conclusions

- This is the first known report of the use of the MASCC score in sepsis screening of patients with hematologic malignancy and non-malignant disorders treated with chemotherapy and transplant. MASCC scores were associated with specific elements that are known components of the MASCC score (e.g. Age, blood pressure, burden of illness), confirming validity of this instrument.
- Significant relationships with patient characteristics indicating more severe disease suggests additional work with larger samples may clarify the value of using the MASCC score in this population
  - Eighty six (86) of 261 patient encounters in this project were screened positive for sepsis (32.9%); however, only 12 encounters (15.1%) yielded positive cultures. This incidence of bacteremia is congruent with other studies of febrile neutropenia.
  - There was a high incidence of positive sepsis screening without verified infection (false positive) using this screening tool in the population, and the data was insufficient to identify whether the MASCC score can predict which individuals will develop severe sepsis, septic shock, or require hospitalization.
- If significant relationships exist between MASCC scores and severity of infection-related illness, the MASCC score tool could be used in conjunction with sepsis screening to more accurately identify patients with hematologic malignancy undergoing chemotherapy or HSCT who are at risk for negative outcomes.

5 Future Directions

- This instrument should be studied in a larger population of transplant patients with an adequate sample to allow for subgroup analysis between types of transplant.
- Evaluation of a larger sample of transplant patients exhibiting fever is needed to fully assess the applicability of the MASCC score in transplant patients.
- Additional variables or layers of screening and evaluation are yet to be identified for clinical applicability.

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