

# Using T2MR technology in critically ill septic patients: are we overcoming the limits of blood culture?



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## Introduction

Bloodstream infections (BSI) are among the most common life-threatening infections. Rapid and accurate detection and identification of BSI causative agent and characterization of its antimicrobial susceptibility are crucial in reducing mortality and morbidity rates. However, the long turn-around time (TAT) of blood culture (BC), the gold standard for BSI diagnosis, is a major drawback in the management of severely ill septic patients. The T2MR technology, FDA cleared, is a novel molecular assay for the identification of ESKAPE bacteria and five *Candida spp.* directly in blood specimens, which can help to overcome BC long TAT (1,2). We analysed the results obtained in critical ill patients at Padua's University Hospital between November 2023 and July 2024 using the T2MR technology to evaluate its performance with respect to BC.

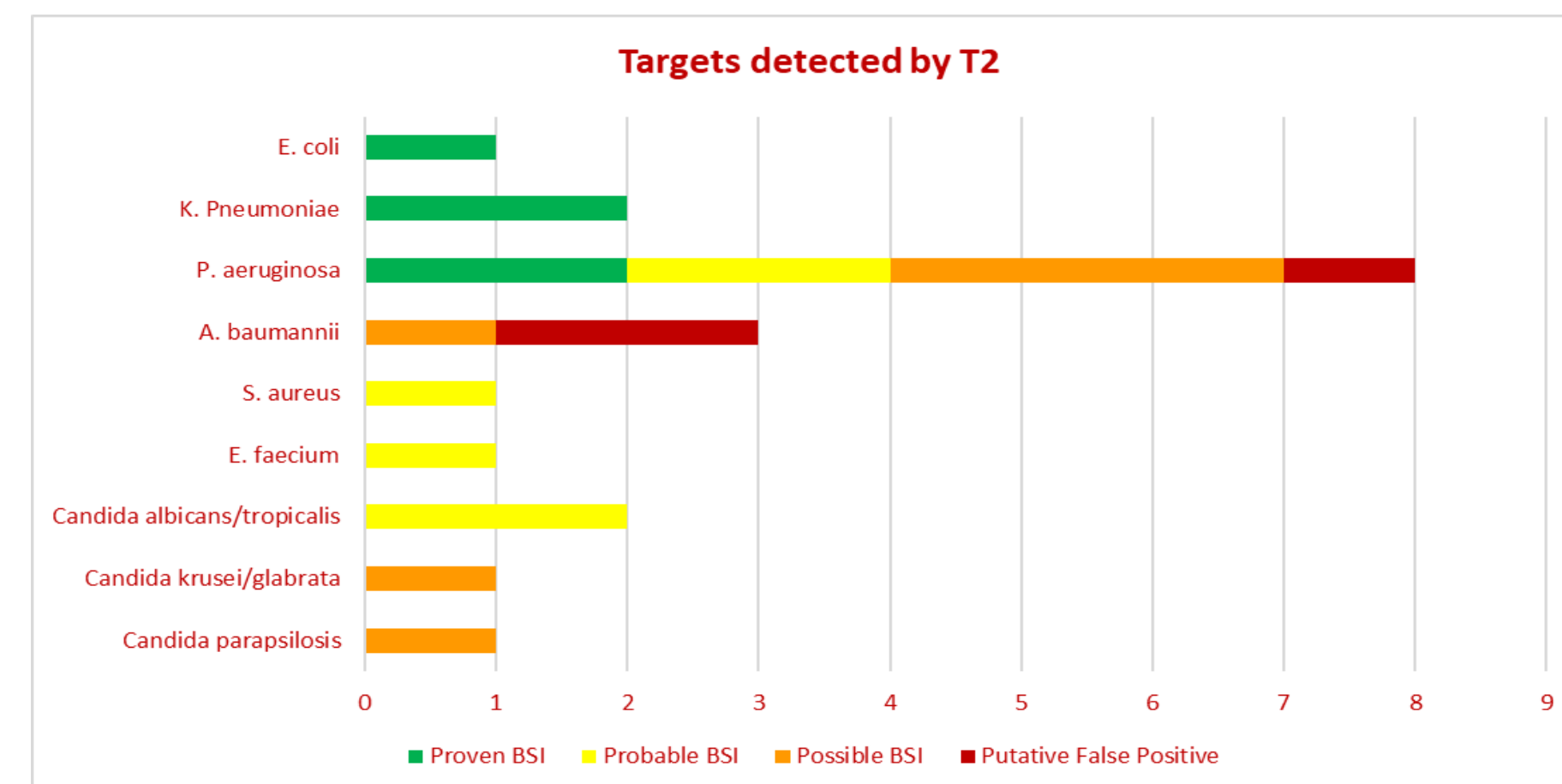
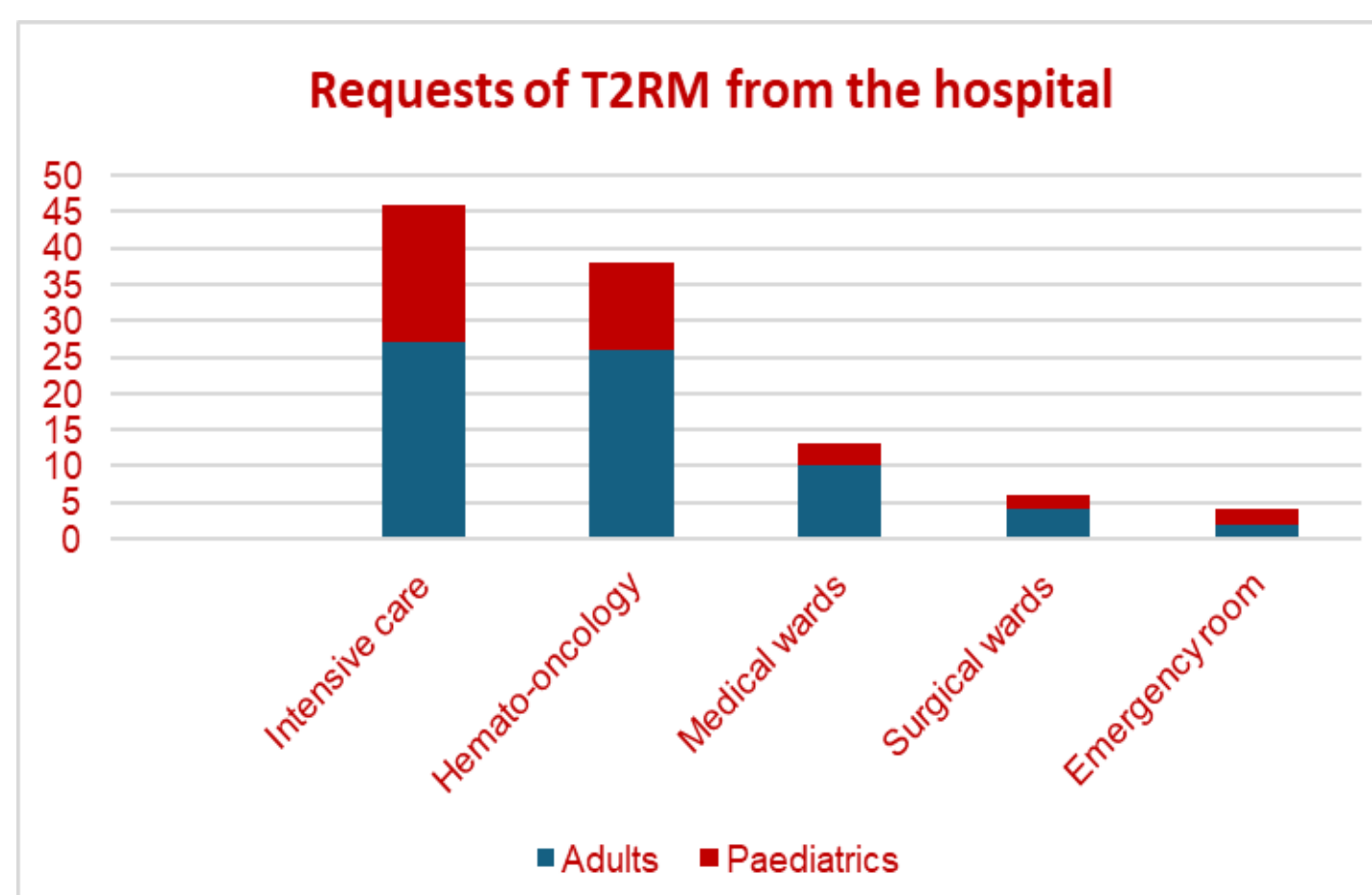
## Materials and methods

During the study period, for the purpose of T2MR processing, whole blood was obtained from 107 patients with clinical and laboratory signs of severe sepsis. 30 were analysed with T2Bacteria alone, 8 with T2Candida alone, and 69 with both panels, so 99 T2Bacteria tests and 77 T2Candida tests were performed. Results were compared to simultaneously collected BC and any culture from relevant body fluids performed within 14 days.

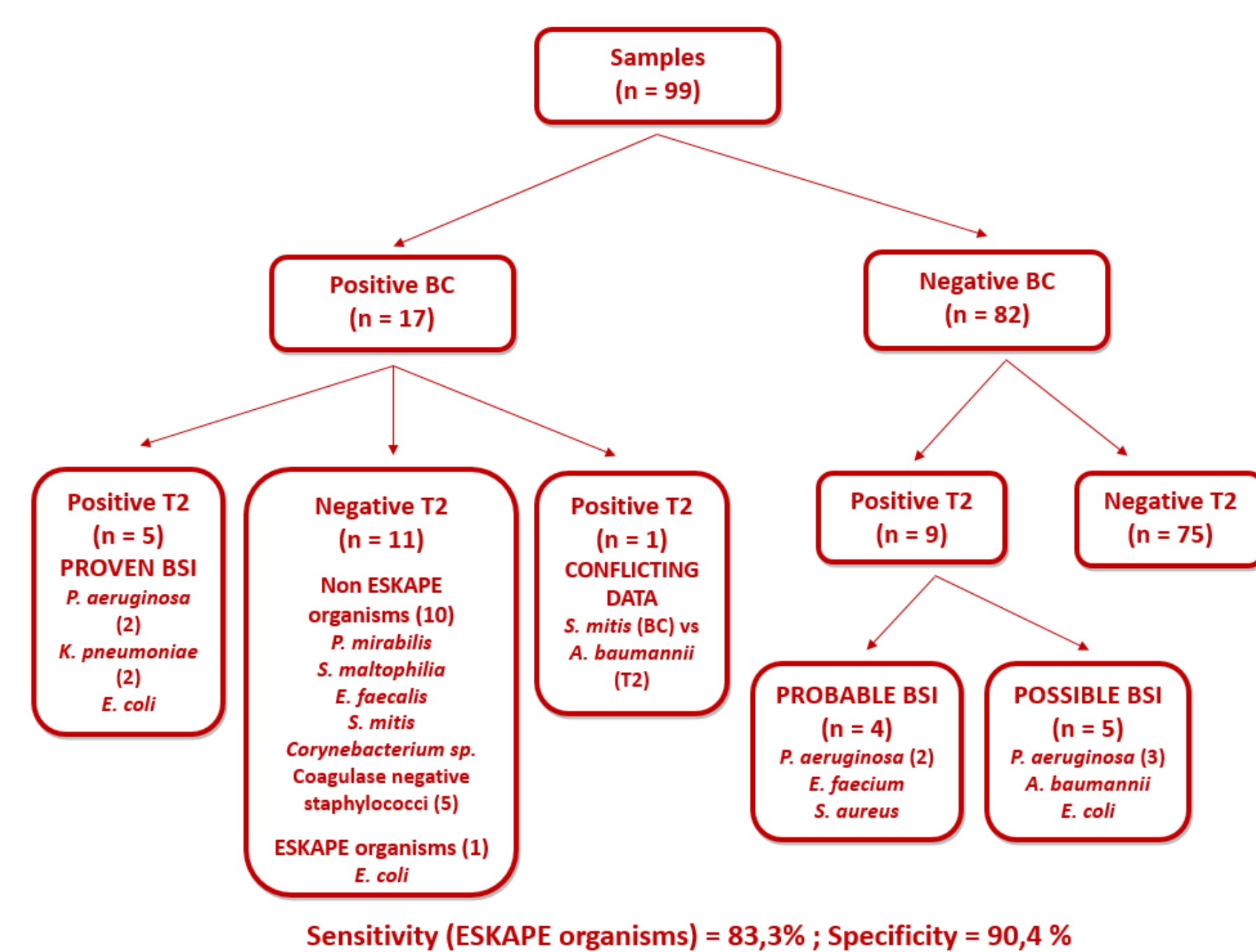


## Results

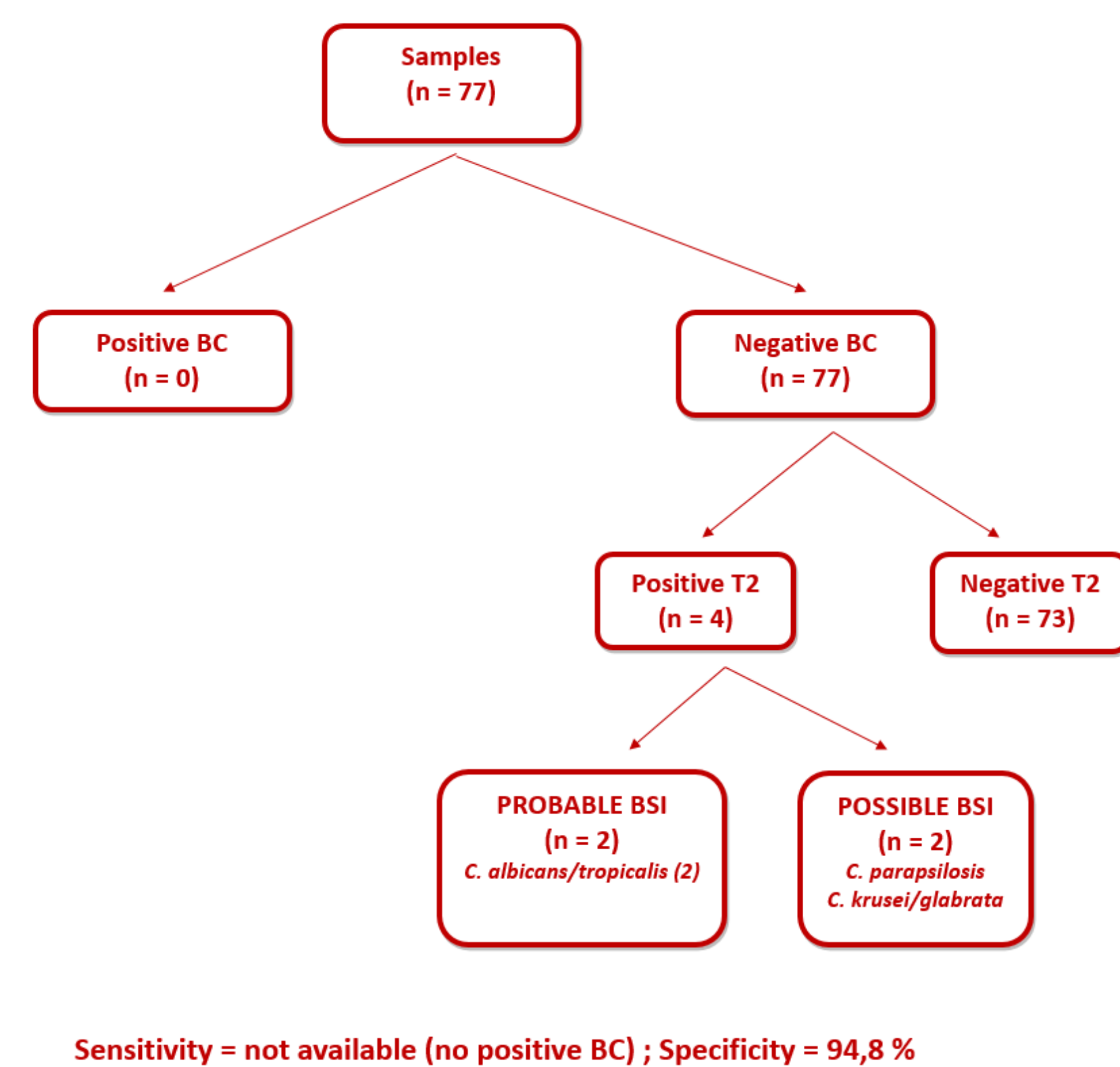
Majority of requests were from intensive care units (46/107) and hemato-oncology (38/107), whereas only 21 were from clinical and surgical wards and 4 from Emergency room. All patients, except the 4 recruited at the ER, were receiving broad-spectrum antibiotics for >48 hours at the sampling time. BC resulted positive in 17/107 (16%) of patients: in 5 cases T2 and BC identified the same microorganism [proven BSI] whereas T2 was negative in 11 positive BC: in 10 no ESKAPE organisms were detected, in 1 *E. coli* was detected in BC. It is important to note that in 2 proven BSI from *K. pneumoniae* T2 in addition identified *A. baumannii* and *P. aeruginosa* respectively, which were not found in BC and in other relevant specimens (putative T2 false positive). In one case T2 detected *A. baumannii* but BC resulted positive for *S. mitis* (putative T2 false positive). Among the 90 patients with negative BC, identical results were obtained in 80 T2 assays. In 13 patients with negative BC, T2 provided a positive result: 6 cases were probable BSI (organisms identified with T2 detected within 14 days in relevant specimens), whereas 7 cases were possible BSI (positive T2 Panel in the absence of supporting culture data within 14 days) but with sepsis clinical features. Taking into account positive BC as the gold-standard for BSI diagnosis, T2MR technology showed an 83,3% sensitivity with a 93,1% specificity overall.



## T2 Bacteria Results



## T2 Candida Results



## Discussions and conclusions

T2Bacteria and Candida Panels evidenced high sensitivity and specificity in septic patients providing a reliable support to confirm or exclude ESKAPE BSIs in critically ill patients.

However relevant drawbacks should need attention in further studies:

- Inability to detect virulent or difficult to treat non-ESKAPE organisms (i.e. *P. mirabilis*, *S. maltophilia*, *E. faecalis*)
- Putative false positive for *A. baumannii* (already described in literature) and *P. aeruginosa*
- Low rate of positive cultures for *Candida spp.* compared with T2: possibly others marker of invasive candidiasis should also be considered in T2 results evaluation in further studies (i.e. 1,3-Beta-D-glucan)

Although study design and patient population was different from Lucignano study (1), sensitivity and specificity of T2MR test are comparable. However, a larger study is necessary to determine the exact clinical impact of T2Bacteria and Candida Panel results on length of hospital stay and mortality benefit in critically ill patients with suspected BSI.

## References

1. Lucignano et al, Effective Rapid Diagnosis of Bacterial and Fungal Bloodstream Infections by T2 Magnetic Resonance Technology in the Pediatric Population, Journal of Clinical Microbiology, 2022
2. Drevinek et al, Direct detection of ESKAPEc pathogens from whole blood using the T2Bacteria Panel allows early antimicrobial stewardship intervention in patients with sepsis, Microbiology Open, 2022

