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An Oral and Maxillofacial Surgery Pro forma for Improving Compliance with Sepsis Six

Running title: OMFS Proforma for Improving Sepsis Six Compliance

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Abstract

Background

Patients presenting to the Oral and Maxillofacial Surgery (OMFS) department with odontogenic or cervico-facial infections are at risk of sepsis. The Sepsis Six bundle significantly reduces mortality if completed within one hour. This paper describes the use of a novel pro forma for OMFS which aims to improve compliance with Sepsis Six.

Methods

A pilot retrospective audit was completed to determine the current use of the Sepsis Six bundle. Data were collected from consecutive patient case notes referred to a single UK OMFS department. A custom pro forma sheet was designed. Two further audit cycles were carried out over a four-year period and dental core trainees focus group gave feedback on the new pro forma.

Results

A pilot retrospective audit showed no compliance (0%) with the original Sepsis Six bundle. Following introduction of the new pro forma, a second audit demonstrated a 38% increase in the delivery of intravenous antibiotics within the first hour. Lactate measurement in the had risen to 50% by the third cycle. Importantly, initial observation of vital signs improved throughout the audit, reaching 97% by the third cycle. The focus group generally supported the benefits of compliance, effective communication and good record keeping using the pro forma.

Conclusion

The introduction of a custom pro forma for OMFS appears to improve compliance to the Sepsis Six bundle which could reduce mortality. Continual team education is required and further audit, focus groups would be useful to determine if this intervention alone is the reason for increased compliance.

Clinical relevance

Scientific Rationale of Study:

Sepsis is a serious condition associated with odontogenic or cervico-facial infections, where early intervention is key to improving mortality and morbidity. Therefore, rigorous protocols within Oral and Maxillofacial surgery departments are required to ensure effective screening, which in turn will facilitate rapid treatment.

Principle Findings:

The introduction of a custom pro forma for OMFS appears to improve compliance to the Sepsis Six bundle.

Practical Implications:

This novel proforma could be adapted and used in other Oral and Maxillofacial Surgery units to improve the screening and management of sepsis.

Keywords

Oral Surgery, Sepsis, Dentoalveolar, Pro forma, Compliance

Background

Sepsis is a life-threatening condition affecting more than 200,000 people, with an estimated 37,000 deaths in the UK every year ^{1,2}. It has been recognised by the World Health Organization as a major public health problem and a potentially avoidable cause of death ³. Alone, sepsis costs the National Health Service (NHS) an average of 2 billion pounds a year ⁴.

Recognising and managing sepsis is often challenging for clinicians given the often non-specific symptoms. Septic patients may deteriorate rapidly, therefore swift administration of antibiotics is central to sepsis management ⁵⁻⁷. Each hour delay in antibiotic administration is associated with a linear increase in mortality ⁸. Following improved understanding of the pathophysiology of sepsis, the Society of Critical Care Medicine and European Society of Intensive Care Medicine have redefined sepsis as a “life-threatening organ dysfunction due to a dysregulated host response to infection” ^{9,10}. It is no longer believed that patients move through a continuum from sepsis to severe sepsis to septic shock. Instead, sepsis, septic shock and organ dysfunction are distinct diagnoses ^{9,10}.

The National Institute of Clinical Excellence (NICE) recommends use of National Early Warning Scores (NEWS) to screen patients for sepsis, followed by red and amber flag system to identify septic or ‘at risk’ patients respectively ¹¹. A comparison of different assessment scores in the Emergency Department (ED) setting demonstrated that NEWS scores were the most specific and sensitive ¹². Prompt and early recognition of sepsis is paramount to improving patient outcomes ¹³. The Surviving Sepsis Campaign was founded in 2002 with the aim of reducing sepsis related deaths and developing evidence-based guidelines. These guidelines have

subsequently been updated, most recently in 2016 ⁵. The key message from these guidelines is the implementation of the “Hour-1 Bundle”, which emphasises the need for rapid fluid resuscitation, to be commenced within the first 60 minutes, demonstrating that reduced patient mortality is associated with increased bundle compliance ^{6,7}. The Sepsis Six protocol was developed in order to improve delivery of this “Hour-1 Bundle” in the NHS ^{14,15}. All three diagnostic and therapeutic steps were found to be poorly performed in gap analysis of compliance, including taking blood cultures, lactate and measuring urine output, as well as giving oxygen, antibiotics and fluids ^{16,17}.

Patients presenting to the Oral and Maxillofacial Surgery (OMFS) department with odontogenic or cervico-facial infections are at risk of sepsis ¹⁸. It is therefore essential that robust protocols are in place to avoid delay and improve patient outcomes ¹⁹. Other units have successfully implemented educational programmes ²⁰ or a pro forma ²¹ to improve compliance. The awareness of sepsis in dental patients is increasingly recognised ²². This paper describes the use of a novel OMFS pro forma which aims to improve compliance with Sepsis Six in a single UK department.

Methods

A pilot retrospective audit was completed to determine the current use of the Sepsis Six bundle. Data were collected from consecutive case notes of patients with odontogenic or cervico-facial infection, referred to a single UK OMFS department. A custom pro forma sheet was then designed including the core parameters of the Sepsis Six pathway and staff were given training on induction on how to complete this new form. Two further audit cycles were

carried out to test compliance with the pro forma over a four-year period. Between the second and third audit cycles, the pro forma was made accessible online as well as in hard copy within department. The gold standard was 100% uptake of the pro forma and administration of intravenous antibiotics to at risk patients within one hour. At risk patients were identified as NEWS > 3, in line with the entry criteria to the local ED Sepsis Screening Tool.

Six dental core trainees (DCTs), who had used the pro forma for a year, were asked to partake in a focus group. The focus group explored the benefits and drawbacks to using the pro forma, including suggestions for improvement (**Supplementary Methods**).

Results

A pilot retrospective audit (n=20) showed no compliance (0%) with the original Sepsis Six bundle. Following introduction of the new pro forma (**Appendix**) a second audit examined a further 65 case notes, of which 7 were incorrectly coded, giving a total of 58 records. A third and final audit to ensure compliance analysed 32 case notes.

Following introduction of the new pro forma, the uptake was 25% in the second cycle, which increased to 59% by the third cycle. Compliance with recording the initial observation of vital signs was good throughout, from the first cycle (90%) to the second (86%) and third cycles (97%). Documenting the delivery of intravenous antibiotics within the first hour increased by 38% from the first to second audit cycle, with 58% and 66% compliance in both the second and third audit cycles. Oxygen was not prescribed for any patients in the first and third cycle,

and only occasionally in the second cycle (0.03%). There was no improvement in lactate measurement in the first two audits, but by the third cycle this had risen to 50% (**Table 1**).

Focus group results

Six DCTs were invited to participate in a focus group following the third cycle of the audit (**Supplementary Methods**). This exercise revealed recurring themes around the ease of use and relevance of the new OMFS pro forma. Most felt it was valuable for record keeping, making note-taking more efficient and legible (“The pro forma certainly gives you confidence regarding decision making and aids comprehensive documentation”, DCT2, lines 10,11). While DCTs had used the original Sepsis 6 bundle and had prior knowledge of the criteria, the new pro forma acted as a useful and relevant prompt throughout their placement. Some concerns were raised about the potential for “tunnel vision to just follow the form” (DCT4, lines 23, 24) and false positive results using the criteria, (“With the false positive scoring for submandibular swellings, the scoring could be changed to admit at a score of 5 and above instead of 4” DCT4, lines 23, 24). However, a consensus was reached that clinical judgement and discussion with senior clinicians would address this issue. Generally, the participants championed the benefits of compliance, effective communication and good record keeping using the pro forma.

Discussion

Evidence suggests that the incidence and severity of dental-related infections may be increasing ²², with recent reports including delayed presentation of dental disease and regional variation in access to NHS dentistry in the UK ²³. A potential sequelae of this is the spread of bacteria resulting in systemic involvement or sepsis ^{24,25}. One of the most challenging aspects is the identification and diagnosis of the condition itself ^{3,12}, which can result in delayed diagnosis, significant morbidity and mortality ²⁶.

The delivery of the original Sepsis Six Bundle represents an on-going difficulty in emergency departments (ED) throughout the UK, specifically within national target time frames ²⁷. Our initial pilot audit highlighted this, with no OMFS cases fully compliant. Published data from two other OMFS units in the UK also demonstrated poor compliance to fluid resuscitation ^{28,29}. While overall compliance did improve from the second cycle to the third (58% and 66% respectively), the target time of one hour for the delivery of intravenous antibiotics was not met. This may have been due to time pressures in the ED, while they juggle the increasing pressures on their department in the current climate ³⁰ or perhaps through focussing on their own departmental four-hour wait targets ³¹. In part due to these pressures, there can be a delay from staff prescribing antibiotics to drug delivery. Our audits were conducted at different times throughout the four-year period to try to reduce any bias from seasonal pressures on the NHS. Despite this, better teamwork alongside busy ED staff and more effective communication is essential to improve sepsis management.

In an attempt to increase compliance, the pro forma was made accessible online as well as in hard copy format within department prior to the third cycle, which did appear to result in an improvement. Primary users of the pro forma are dental trainees and this dynamic workforce change annually as they progress through training. New staff must be educated during their induction process on how to access and complete the pro forma. Other similar studies have also identified staff education as essential to delivering Sepsis Six, which may be a confounding factor in assessing compliance in this study ^{32,33}. Given the relatively low incidence of sepsis, this study ran over a four-year period and diagnosis of the condition did change slightly over this period. However, this is not likely to have influenced our study as 'at risk' patients were identified as NEWS score >3 throughout. The ever-evolving guidance of sepsis management highlights the need to continually update our pro forma when new evidence becomes available.

Only 50% of patients in the third cycle had a lactate measurement. More worryingly, one of the patients who did not have a lactate measured was a shared case with the Ear, Nose and Throat (ENT) team meaning multiple people from across teams may be missing key parameters. Elevated blood lactate levels in critically ill patients are associated with increased morbidity and mortality so should be recorded ³⁴. Time pressures are unlikely to be the reason as every patient in the final two cycles had blood drawn, so it is potentially an oversight, gap in knowledge or a lack of awareness with respect to the value of this biomarker which has prevented it from being requested. Oxygen was almost never prescribed across the four-year period. Support of oxygen saturations may only have been indicated in severe cases, which are rare given the relatively low incidence of sepsis in this specialty.

Record keeping did improve using the new pro forma, particularly with specific OMFS signs of severe infection such as trismus and tissue space involvement. This pro forma could therefore be used by staff in ED, with less specialty specific knowledge to ensure an accurate assessment and higher quality care for OMFS patients. The tick boxes and diagrams make clinical clerking more streamlined and notes legible for other staff, so could reduce time taken to assess patients and therefore devise and action a treatment plan.

Conclusion

The introduction of a custom pro forma for OMFS in one UK institution appears to improve compliance to the Sepsis Six bundle which could reduce mortality. Continual team education is required and further audit, focus groups or semi-structured interviews perhaps across a range of different clinical settings would be useful to determine if this intervention alone is the reason for increased compliance.

Conflicts of Interest

The authors have no conflicts of interest to disclose

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