The BeSMART (Best Supportive Management for Adults Referred with Tonsillopharyngitis) multicentre observational study

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ABSTRACT

INTRODUCTION Tonsillopharyngitis is the most common ear, nose and throat emergency admission, with 80,000 episodes recorded in England in 2015–2016. Despite this, there is a paucity of evidence addressing the supportive management of tonsillopharyngitis in inpatients. The aim of this retrospective multicentre observational study was to consider the Best Supportive Management for Adults Referred with Tonsillopharyngitis (BeSMART) in the inpatient setting, and to establish any associations between practice and outcomes.

METHODS Seven hospitals in North West England and North East Scotland participated in the study. Overall, 236 adult patients admitted with tonsillopharyngitis were included. The main outcome measures were interval to return to soft diet, length of stay (LOS), pain scores and readmissions.

RESULTS Women were more likely to seek professional help before presenting to secondary care ($p=0.04$). Patients admitted at the weekend were more likely to have a shorter LOS ($p=0.03$). There was no relationship between day of admission and seniority or specialty of the doctor initially seen. Prescription of corticosteroid, analgesia and a higher initial intravenous fluid infusion rate were not related to a shorter LOS.

CONCLUSIONS This study is the first to yield valuable insights into the inpatient management of tonsillopharyngitis. This work represents part of an ongoing project to establish the evidence for common medical interventions for sore throat. Patient and professional surveys as well as a prospective interventional study are planned for the future.

KEYWORDS

Tonsillitis – Corticosteroid – Analgesia – Length of stay

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Tonsillopharyngitis is the most common ear, nose and throat (ENT) emergency admission, with over 80,000 recorded in England in 2015–2016.¹ Despite this, there is a paucity of evidence addressing the supportive management of tonsillopharyngitis in inpatients. This is recognised by Bird *et al* in their review: more evidence is needed to improve the patient experience and to streamline care.²

Corticosteroid

Single doses or short courses of corticosteroid are advocated by many ENT surgeons for those who have severe dysphagia or stertor, or where significant inflammation is seen in the oropharynx. Practice is variable throughout the UK. The evidence base for the use of adjuvant corticosteroid in sore throat is set out in a Cochrane review by Hayward *et al*.³

Their meta-analysis included eight placebo controlled trials, none of which took place in Europe. Participants were recruited in the outpatient setting and the main outcome measure was relief from sore throat. The authors found a small but significant effect: duration of sore throat was reduced by 6.3 hours overall (risk ratio for resolution of pain at 24 hours: 3.2, 95% confidence interval [CI]: 2.0–5.1).

Analgesia

It is also common practice to prescribe a regimen of simple analgesia. There are no randomised placebo controlled trials on the use of different analgesics in sore throat. Some moderate quality evidence suggests that paracetamol and non-steroidal anti-inflammatory drugs (NSAIDs) are effective.⁴ Similarly, the use of topical benzydamine spray is associated with significantly less pain in the outpatient management of tonsillitis.^{5,6}

Intravenous fluids

While there is no evidence concerning the use of intravenous fluid infusions in tonsillopharyngitis, many clinicians' standard practice is to offer intravenous rehydration to patients reporting reduced fluid intake with symptoms and signs of dehydration.

Trainee research collaboratives

The postgraduate trainee-led research collaborative (TRC) is a relatively new phenomenon in the ENT arena. In the UK, the formal collaborative working model was first developed by general surgical and neurosurgical trainees,^{7–11} who have published a number of studies.^{12,13} There are now regional ENT TRCs across the UK and efforts are coordinated nationally through the Integrate network.

As part of their continuing professional development, trainees are already obliged to generate research and audit work. The aim of collaboratives is to focus trainees' labour into one consensus study question that addresses gaps in evidence-based practice. Patients and professionals gain from the generation of better quality work.

BeSMART objectives

MERC is undertaking the first multicentre project to consider the inpatient management of tonsillopharyngitis: Best Supportive Management for Adults Referred with Tonsillopharyngitis (BeSMART). This project is divided into three phases. Phase 1 (BeSMART1) consists of an observational study, phase 2 (BeSMART2) will examine the results of a linked patient and professional survey, and phase 3 (BeSMART3) is a planned prospective study to address the deficiencies in knowledge uncovered by the first two phases. The objectives of BeSMART1 were to evaluate current practice in the inpatient management of tonsillopharyngitis, and to establish the effects (if any) of admission variables and medication on patient outcomes.

Methods

This was a retrospective multicentre observational study. It was registered as a service evaluation with the appropriate

institutional review body at all seven centres participating in the study. Data were processed and anonymised at each centre before being passed to the chief investigator via secure email. We adhered to institutional information governance protocols.

The study was undertaken at six hospital sites in North West England and at one in North East Scotland, coordinated through MERC. The participating centres comprised Aberdeen Royal Infirmary, Aintree University Hospital (lead), Arrowe Park Hospital, Leighton Hospital, Royal Liverpool Hospital, Salford Royal Hospital and Warrington Hospital.

Participants and data sources

Clinical coding searches were performed using the codes J02 and J03 from the tenth revision of the International Classification of Diseases. A retrospective search was undertaken for consecutive individuals admitted to hospital from March 2015 onwards. Their health records were then reviewed for a documented diagnosis of tonsillopharyngitis. Patients aged under 16 years, those with a positive glandular fever test, those with a peritonsillar abscess and those with an incorrectly coded diagnosis were excluded from analysis.

Six of the seven participating centres examined seventy cases each for inclusion. Since Aintree University Hospital is a regional centre and accepts referrals from two district general hospitals without ENT cover, 100 cases were scrutinised for inclusion there. The study's four predetermined outcome measures comprised interval to return to soft diet, length of stay (LOS), pain score and readmission. Interval to return to soft diet and LOS were both measured to the nearest 12 hours in 12-hour time bands. Readmission was defined as any unplanned re-presentation to hospital with sore throat within 28 days of discharge. Explanatory variables (eg demographics, date of admission and corticosteroid prescriptions) were captured, as was information on healthcare seeking behaviours.

Statistical analysis

Data were collated in Excel (Microsoft, Redmond, WA, US) and analysed using SPSS[®] version 22 (IBM, New York, US). Sample distributions were examined and summary measures were calculated. Where necessary, logarithmic transformations were performed on skewed continuous data. The associations between normally distributed data were analysed with the appropriate t-test and Levene's test for equality of variances. Categorical data were analysed using Pearson's chi-squared or Fisher's exact tests. Pearson's correlation coefficient was used to test the linear relationship between continuous variables. The significance level (α) for all tests was set at 0.05. Binomial logistic regression was used to model the effects of the explanatory variables on each outcome measure.

Results

Figure 1 describes the number of cases excluded from the study. The median coding accuracy was 60% (range: 33–99%). For all explanatory variables, the proportion of missing data was <1%. For outcome measures, missing data

accounted for 0.4% of both LOS and readmission data, and 10% of return to soft diet data. Pain scores were only reliably documented in two centres, yielding a total of 46 cases (14% missing across two centres; 81% across all centres). Sub-group analysis was therefore performed for pain, using only these two centres.

Baseline characteristics and demographics

A total of 236 cases were included in the study. There were no deaths or critical care unit admissions. Table 1 details the characteristics of our sample. The median LOS reflected national data¹ although sex did not, which was possibly because the national cohort also included children. There were statistically significant reductions in both heart rate (mean difference: 22.31bpm, 95% CI: 19.43–25.18bpm, $p<0.01$) and core temperature (mean difference: 0.86°C, 95% CI: 0.71–1.02°C, $p<0.01$) at 24 hours after admission compared with measurements taken at admission.

Healthcare seeking behaviours

Women were more likely to seek professional help from a general practitioner or walk-in centre at some point before presenting to secondary care (Table 2). There was no relationship between age and the healthcare seeking behaviours examined. These behaviours were not statistically associated with any outcome measure.

Weekend admissions

Day of admission was statistically related to LOS. Admissions on Saturdays and Sundays were significantly associated with LOS ≤ 24 hours ($p=0.03$), and this translated into a significant protective effect (odds ratio [OR]: 0.78, 95% CI: 0.64–0.97).

Admission at the weekend was not associated with patients’ healthcare seeking behaviours (Table 2). When compared with weekdays, there appeared to be no difference in the number of patients initially seen by an ENT doctor ($p=0.23$), or by a registrar or consultant ($p=0.81$). Moreover, seeing a more senior doctor was not related to any outcome measure. Interestingly, however, seeing an ENT doctor was related to a shorter interval to return to soft diet ($p=0.01$) (Table 3).

Medication

Standard first-line antibiotic therapy at all centres was intravenous benzylpenicillin. This was substituted with clarithromycin or clindamycin for patients with known penicillin hypersensitivity.

A total of 107 patients (45%) were prescribed corticosteroid. The drug of choice (84%) was an immediate dose on admission of 8mg dexamethasone phosphate (or equivalent). The great majority (99%) of all corticosteroid was administered intravenously.

Figure 1 Flowchart of patient selection

Table 1 Sample characteristics and comparisons with national data where available		
Variable	BeSMART ¹	National data ¹
Total cases	236	–
Female sex	146 (62%)	55%
Median age in years	27 (range: 16–70)	–
Mean age in years	29	16
Median length of stay in days	1 (range: 0.5–7)	1
Weekend admission	75 (32%)	–
Return to soft diet ≤24h	141 (60%)	–
Length of stay ≤24h	138 (58%)	–
Readmissions	11 (5%)	–
¹ Where available		

Table 2 Relationships between demographics and having previously sought professional help for the same episode			
Variable		p-value	Mean difference
Age distribution	Previously sought help	0.52	0.84 yrs (95% CI: -1.72–3.39 yrs)
Female sex	Previously sought help	0.04	–
Weekend admission	Previously sought help	0.39	–
CI= confidence interval			

Administration of corticosteroid was not associated with interval to return to soft diet, LOS or readmission (Tables 3–5). When grouped by exposure to corticosteroid, there was no difference in the admission heart rates ($p=0.89$) or core temperatures ($p=0.49$) between the groups. This suggests that patients prescribed corticosteroid were no more systemically unwell than those who were not prescribed corticosteroid.

A binomial logistic regression model was fitted for corticosteroid prescription ($\chi^2=18.33$; $p=0.05$; Nagelkerke's $R^2=0.44$) including all admission variables and vital observations. The only significant factor influencing the use of corticosteroid was seeing an ENT doctor on admission (OR: 14.51, 95% CI: 1.54–137.22, $p=0.02$).

Prescription of paracetamol was not associated with any outcome measure. Conversely, prescriptions of NSAIDs, weak opioids and benzydamine spray were associated with a longer interval to return to soft diet as well as a longer LOS (Tables 3–5).

Table 3 Relationships between return to soft diet and explanatory variables		
Variable		p-value
Return to soft diet ≤24h	Previously sought help ^a	0.88
	Initially saw ENT ^b	0.01
	Initially saw senior ^c	0.09
	Corticosteroid prescription	0.53
	Paracetamol prescription	0.75
	NSAID prescription	Significantly associated with return to soft diet >24h
	Weak opioid prescription	
	Benzydamine prescription	
ENT = ear, nose and throat; NSAID = non-steroidal anti-inflammatory drug		
^a Patient previously sought professional help for the same episode; ^b Patient was managed initially by an ENT doctor, including cross-cover doctors; ^c Patient was managed initially by a registrar or consultant of any specialty		

Intravenous fluids

All intravenous fluids used were crystalloids. Fluid prescription was significantly associated with tachycardia on admission ($p=0.02$) but not temperature ($p=0.07$). The median infusion rate for the first litre of fluid was 222ml/hr (range: 100–1,000ml/hr). Neither the infusion rates for the first litre of fluid nor the total number of litres infused correlated with any of the outcome measures.

Pain score subgroup analysis

This outcome measure was analysed separately. A modified numeric rating scale (NRS) for pain was used at both centres that returned relatively complete data. Both admission and 24-hour pain scores were standardised, and no explanatory variables appeared to be statistically related to them.

Modelling outcome measures

Logistic regression was performed for the four outcome measures. No statistically significant models could be fitted for high pain score at 24 hours (defined as standardised NRS >6/10), interval to return to soft diet or readmission.

Despite reaching statistical significance ($\chi^2=27.01$; $p<0.01$; Nagelkerke's $R^2=0.19$), the logistic regression model for LOS >24 hours was not deemed biologically significant. Only NSAID and benzydamine prescriptions added to the model, and both predicted an increased LOS.

Table 4 Relationships between LOS and explanatory variables		
	Variable	p-value
LOS ≤24h	Previously sought help ^a	0.19
	Initially saw ENT ^b	0.50
	Initially saw senior ^c	0.13
	Corticosteroid prescription	0.62
	Paracetamol prescription	0.53
	NSAID prescription	Significantly associated with LOS >24h
	Weak opioid prescription	
	Benzylamine prescription	
ENT = ear, nose and throat; LOS = length of stay; NSAID = non-steroidal anti-inflammatory drug		
^a Patient previously sought professional help for the same episode;		
^b Patient was managed initially by an ENT doctor, including cross-cover doctors; ^c Patient was managed initially by a registrar or consultant of any specialty		

Table 5 Relationships between readmission and explanatory variables		
	Variable	p-value
Greater number of readmissions	Previously sought help ^a	0.24
	Initially saw ENT ^b	0.61
	Initially saw senior ^c	0.44
	Corticosteroid prescription	0.38
	Paracetamol prescription	0.54
	NSAID prescription	0.87
	Weak opioid prescription	0.78
	Benzylamine prescription	0.12
ENT = ear, nose and throat; NSAID = non-steroidal anti-inflammatory drug		
^a Patient previously sought professional help for the same episode;		
^b Patient was managed initially by an ENT doctor, including cross-cover doctors; ^c Patient was managed initially by a registrar or consultant of any specialty		

Discussion

This study raises the possibility that many common medical interventions have relatively small effects in terms of objective outcomes. Intriguingly, although there is no evidence of any difference in the type of care that patients received, there is a possibility that admission at the weekend is associated with a shorter LOS.

Key points

- > Women were more likely to seek professional help before their condition worsened.
- > Seeing an ENT doctor was related to a quicker return to soft diet but not a shorter LOS.
- > Prescription of corticosteroid, intravenous fluids and analgesics were not related to a shorter LOS.
- > Patients admitted at the weekend were more likely to have a shorter LOS.

Strengths of the study

To our knowledge, this is the first project to address the supportive management of tonsillopharyngitis specifically in the inpatient setting. Both the relatively large number and the broad geographical (rural and urban) mix of cases help to support the validity and applicability of this work. Despite examining records retrospectively, documentation was fairly good, with proportions of missing data below 20% for all variables but one.

Study limitations

The retrospective data collection and the lack of randomised allocation were possible sources of bias. This may be mitigated somewhat by analysing a relatively large number of

cases from multiple centres. As a non-randomised study, the presence of confounding factors such as disease severity and treatment heterogeneity is likely, and this could explain the effects observed.

While no statistically significant effect was found relating to the use of corticosteroid, it could be argued that clinicians tend to prescribe adjuvant medication when they believe disease severity to be high. Patients with more severe disease have an inherently longer LOS, which can muddy the waters.

Nevertheless, our data do not support the notion of disease severity as a significant confounder. On the one hand, patients without tachycardia on admission (by inference, more systemically well) were more likely to be discharged early (OR: 1.28, 95% CI: 1.04–1.58). However, when the admission heart rates and temperatures of both corticosteroid and non-corticosteroid groups were examined, there was no statistically significant difference ($p=0.89$ and $p=0.49$ respectively).

It is possible that LOS and interval to return to soft diet are not sensitive enough measures to demonstrate any significant effect from medical interventions. For practical reasons, it was decided to record both of these outcome measures in 12-hour time bands. Similarly, pain scores are the most quoted outcome measure in randomised studies on tonsillopharyngitis. Unfortunately, the poor documentation of pain scores in our sample hampers comparison with other studies.

These limitations will be addressed in a planned prospective study (BeSMART3).

Weekend admissions

Patients admitted at the weekend appeared to have a shorter LOS. The reasons are unclear since it was beyond the scope

of this study to examine the factors that might contribute to this. Our evidence implies that patients are no less likely to see more specialist or senior doctors at the weekend. As specific staffing, administrative or patient morbidity data were not captured, it is not possible to offer an explanation for this effect.

Comparisons with other studies

A number of studies suggest managing some patients who present to secondary care as outpatients, usually after a short stay in hospital.^{2,14,15} Our data indicate that once admitted to hospital, no specific medical intervention has a strong effect on LOS. It is therefore important to understand what has led to admission, both in terms of medical management and in terms of the beliefs and attitudes of patients and health professionals. This is the focus of a second and ongoing project that will examine both patients' and professionals' beliefs and expectations in this area.

Conclusions

Our paper presents the first, pilot phase of a comprehensive project to examine the factors surrounding the management of inpatients with tonsillopharyngitis. This study offers some insights into the efficacy of certain medical interventions as well as the effects of admission variables on patient outcomes. We look forward to building on the foundations laid down by this work in the BeSMART2 and BeSMART3 components.

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