J Antimicrob Chemother 2023; **78**: 84–92
https://doi.org/10.1093/jac/dkac358 Advance Access publication 22 October 2022

Journal of Antimicrobial Chemotherapy

Characteristics of the sore throat test and treat service in community pharmacies (STREP) in Wales: cross-sectional analysis of 11 304 consultations using anonymized electronic pharmacy records

Efi Mantzourani [1,2]*, Diana Wasag [3], Rebecca Cannings-John[4], Haroon Ahmed [3] and Andrew Evans[5]

[1]*Cardiff School of Pharmacy and Pharmaceutical Sciences, Cardiff University, Redwood Building, King Edward VII Avenue, Cardiff CF10 3NB, Wales, UK;* [2]*Primary Care, Digital Health and Care Wales, NHS Wales, Cardiff, Wales, UK;* [3]*Division of Population Medicine, Cardiff University, Cardiff, Wales, UK;* [4]*Centre for Trials Research, Cardiff University, Cardiff, Wales, UK;* [5]*Primary Care Services, Welsh Government, Cardiff, Wales, UK*

*Corresponding author. E-mail: MantzouraniE1@cardiff.ac.uk

Received 25 July 2022; accepted 2 October 2022

Background: An NHS-funded sore throat test and treat (STTT) service was introduced in selected community pharmacies in Wales. Service users were screened using FeverPAIN/Centor scores, offered rapid antigen detection testing (RADT) to detect group A *Streptococcus* if appropriate, and supplied with antibiotics (by the pharmacist) if indicated. Following an initial evaluation, the service was rolled out nationally.

Objectives: This study forms part of the long-term STTT evaluation. The aim was to describe characteristics of the service and service users, the delivery, service outcomes, patient safety and antibiotic prescribing.

Methods: Cross-sectional descriptive study using anonymized individual-level data from electronic pharmacy records of all eligible STTT service users between November 2018 and February 2020.

Results: We identified 11 304 pharmacy STTT consultations in service users aged 6 years and over, with a median age of 25 years (IQR: 12 to 44). RADT was undertaken in 8666 (76.7%) consultations with 2503 (28.9% of RADT) positive tests. In total, 2406 (21.3%) service users were supplied with antibiotics. Pharmacists managed 91% of consultations in the pharmacy and referred only 937 (9.3%) service users to a GP and 27 (0.2%) to the Emergency Department. Higher rates of antibiotic supply were observed in out-of-hours consultations when compared with in-hours (24.9% versus 20.9%).

Conclusions: This is the largest description of a pharmacy-led STTT service to date and suggests it can be delivered at scale to align with a pre-specified pathway that promotes appropriate use of RADT and antibiotics. The service could substantially reduce workload from a common illness in other heavily pressurized areas of primary and emergency care.

Introduction

Acute sore throat is a common presentation in primary care and a leading cause of antibiotic prescription.[1] In the UK, almost 10% of patients consult their GP with sore throat every year and 8% of all acute prescribing relates to sore throat management.[2,3] Most acute sore throats are caused by a virus and result in mild self-limiting illness that can be self-managed with symptomatic treatment and does not require antibiotics.[4] Bacterial sore throats are mainly caused by group A haemolytic *Streptococcus* (GABHS) and account for 5%–30% of all sore throat presentations.[5] GABHS sore throats may lead to severe systemic complications such as acute rheumatic fever and glomerulonephritis as well as suppurative complications such as peritonsillar abscess (quinsy).[6,7] Identifying people with GABHS-related acute sore throat (who may benefit from antibiotics) from clinical history and examination is difficult due to overlap of clinical signs and symptoms between bacterial and viral infections.[8] It is generally accepted that clinical scoring criteria such as Centor and FeverPAIN can help identify those with greater likelihood of GABHS infection,[9] but it has also been argued that scoring systems cannot replace clinical reasoning and judgement.[10] A

2020 meta-analysis of diagnostic test accuracy studies showed that a Centor score of 0 is likely to be sufficient to rule out GABHS infection.[11] However, for Centor scores of ≥1, discrimination between patients with GABHS and viral infections is less accurate.[11]

To further support diagnosis of GABHS-related pharyngitis, throat culture or rapid antigen detection testing (RADT) can be used,[6] and this is part of routine clinical practice in some countries, e.g. Sweden and Denmark.[12,13] Systematic reviews and meta-analyses estimate a summary RADT sensitivity of approximately 86% (95% CI 83–88) and a summary specificity of approximately 96% (95% CI 94–97).[14–16] Previous research assessing the benefit of sore throat point-of-care testing has been mixed. A previous randomized controlled trial found no benefit of using clinical scoring tools in combination with antigen tests over clinical scoring alone.[17] However, a recent secondary analysis of existing data examined nine strategies for managing patients with sore throat against two validation datasets. The study concluded that point-of-care testing can play an important role in safely targeting the use of antibiotics for patients with an apparently uncomplicated acute sore throat.[18]

In a recent review, NICE concluded that the use of RADT by GPs in the UK is not cost-effective and hence not of value in routine primary care, and only required if the diagnosis of GABHS needs to be confirmed with certainty.[19] Despite this, the UK 5 year antimicrobial resistance strategy recognizes the role of point-of-care diagnostics to assess the appropriateness of diagnosis and treatment with antibiotics.[20] A recent Cochrane systematic review of rapid testing for sore throat in primary care suggested that antibiotic prescribing rates might reduce by as much as 25% when RADT is used. However, it recommended further research to assess the efficacy and safety of rapid test-guided antibiotic prescribing.[1]

In the UK, NICE has also acknowledged that further research is needed to assess the value of RADT on antibiotic prescribing for sore throat in different healthcare settings such as community pharmacies.[21] It has been suggested that community pharmacy staff can play an important role in antimicrobial stewardship given their expertise in medicines and accessibility to patients.[22] Data from the USA suggest that pharmacists might play a significant role in testing for influenza, HIV and group A streptococcal pharyngitis.[23] Data from countries such as Canada,[24] Australia,[25] France[26] and England[27] confirm patient readiness to access point-of care services in community pharmacies, the ability of pharmacists to manage patients presenting with sore throat in community settings, and that community pharmacy-based GABHS testing can facilitate prompt antibiotic treatment when indicated.[24] Essack *et al.*[4] further concluded that pharmacy RADT can promote appropriate antibiotic use and reduce the need for GP consultations.

In Wales, a national NHS-funded sore throat test and treat (STTT) service commenced in November 2018, to test the feasibility and benefit of a community pharmacy-based assessment for sore throat, incorporating RADT where appropriate.[28] The aims of the service were to transfer the care of patients with uncomplicated sore throats from GPs to community pharmacy, improve antimicrobial stewardship, reduce the number of emergency out-of-hours appointments and provide service-user education. Data from the first 5 months of the pathfinder showed the service may have a role in safe management of uncomplicated cases of sore throats in the community, and in promoting antibiotic stewardship (Mantzourani *et al.*).[28] The service was well received by both pharmacists and patients,[29,30] with patient satisfaction not found to be correlated to antibiotic supply. In a health economic evaluation of use of RADT in pharmacy settings, as recommended by NICE,[21] Health Technology Wales concluded that STTT had a 100% probability of being cost-effective, at a threshold of £20 000 per QALY.[31]

The initial evaluation comprised relatively small numbers of consultations over a short time period. Further evaluation is needed to establish the long-term impact of STTT on the management of sore throat. The aim of this study was to describe key characteristics of the service, service users and antibiotic supply rates between November 2018 and February 2020, to better understand the value and need for the service, and its wider implications for primary care services.

Materials and methods

Ethics

Data used in this study were collected as part of routine clinical care. Data provided to the researchers were fully anonymized. Individuals could not be identified. The study was registered with the Cardiff School of Pharmacy and Pharmaceutical Sciences ethics committee and with the Research and Development department of Velindre NHS Trust. There were no identifiers that could link information to an individual in any of the datasets; as such, this study required no ethical approval.

STTT service implementation and roll-out

In Wales, seven local health boards (LHBs) are responsible for delivering healthcare services within their respective areas. The pathfinder STTT service commenced in November 2018 and included 23 pharmacies in one LHB in South Wales, with a further 33 pharmacies in one LHB in North Wales (December 2018). By December 2019, further LHBs were commissioning pharmacy sites across all areas of Wales to provide a STTT service, adopting a staged implementation based on a balance of population needs and expressions of interest from pharmacists. The service was temporarily suspended due to the COVID-19 pandemic in March 2020. At that time, 134 pharmacies across all seven LHBs had joined the scheme.

The service has been described in detail elsewhere[28–30] but an overview based on the STTT service specification is provided in Figure 1: structured clinical assessment using FeverPAIN or Centor scores, RADT for FeverPAIN ≥ 2 and Centor ≥ 3, and antibiotic supply in the pharmacy if RADT positive, after discussion with the patient. The specification describes how the service should be run by community pharmacists, including training requirements and referral guidance, and enables pharmacists to proceed to antibiotic supply without a prescription if specific criteria were met.

Study design and population

This was a cross-sectional descriptive study using anonymized individual-level data from electronic pharmacy records of all STTT service users aged 6 years and older in Wales between November 2018 and February 2020.

Data collection and preparation

STTT consultation data for all service users were obtained from the *Choose Pharmacy* IT application. *Choose Pharmacy* is used in 98% of community pharmacies in Wales, to support service delivery and record

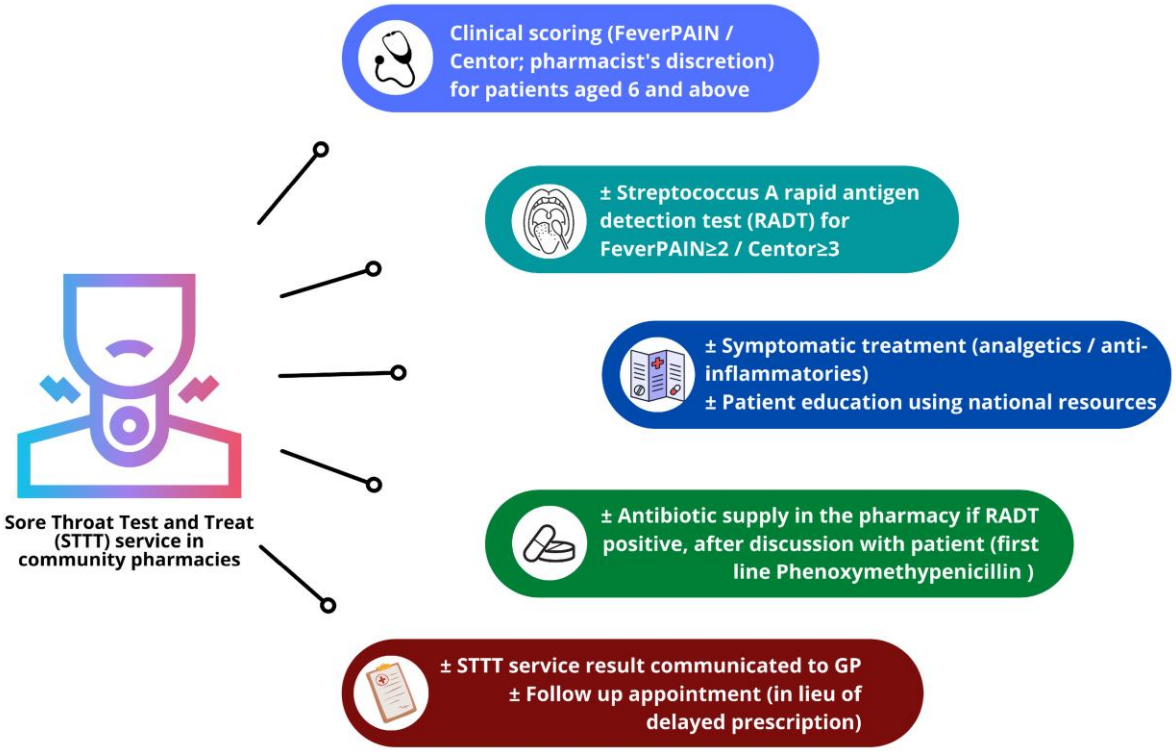

Figure 1. Overview of the service specification for the community pharmacy-led STTT service. This figure appears in colour in the online version of *JAC* and in black and white in the print version of *JAC*.

consultations. Pharmacists input consultation data using a combination of pre-defined drop-down options and free-text comments. Data collected included standardized information after matching service users to existing health records in the Welsh Demographic Service, pre-defined options for clinical information, and free-text responses.

Microsoft Excel® v2207 was used to prepare the master dataset, comprising monthly extracts of STTT consultations. The structure of data input from pharmacists on *Choose Pharmacy* prevented incomplete or duplicate records. Data were transferred to Stata Statistical Software release 16 to undertake statistical analyses.[32] Data were checked independently by two researchers to ensure all records were transferred correctly, and no data were lost in the process.

Outcomes and data analysis

Key parameters of interest were: number of STTT consultations; demographics of service users; proportion of service users reconsulting with a pharmacist for their sore throat; severity of sore throat presentations in community pharmacy based on clinical scoring; number and rates of different referral sources to the service; percentage of service users who would have used alternative health services had STTT not been available and nature of alternative actions; frequency of STTT activity across each month and across the days of the week, including in- and out-of-hours consultations; proportion of consultations using Centor/FeverPAIN clinical scoring tools; number and proportion of RADT completed following the STTT algorithm and reasons for deviations; antibiotic supply rates, including in- and out-of-hours consultations; number and nature of additional pharmaceutical advice; and number and proportion of pharmacy referrals to GPs and emergency services.

Descriptive statistics were used to describe key characteristics of the STTT service and service users. Categorical variables were summarized with total numbers, frequencies and proportions with CI calculations based on Newcombe, 1998.[33] Continuous variables were summarized with medians and IQRs.

Results

The service overview, utilization and outcomes of completed STTT consultations in community pharmacies in Wales, between November 2018 and February 2020, are summarized in Table 1 and Figure 2.

Service overview and utilization

During the study period, a total of 11 380 sore throat consultations were undertaken across the 134 participating community pharmacies, of which 11 304 (99.3%) were for service users aged 6 years and above and were included in the analysis (Figure 1). Most participants ($n=10\,407$; 92.1%) were assessed using FeverPAIN; the remainder (7.9%) were assessed using the Centor scoring tool. Median age of service users was 25 years (IQR 12–44) and two-thirds (67.4%) were female (Table 1). A total of 10 215 (90.4%) used the service on one occasion, and 1089 (9.6%) on two or more. Most service users consulted in the pharmacy within 4 days of symptom onset ($n=8260$; 73.1%), with 2113 (18.7%) waiting for 1 week or more.

Half (49.4%) of service users were referred by their GP or practice staff, with 5267 (46.6%) self-referring. Of the remainder, 202 (1.8%) were referred by other healthcare professionals, and 159 (1.4%) by emergency services [GP out of hours (GP OOH), NHS 111 or Emergency Department]. At service roll-out (November 2018),

Table 1. Descriptive overview of the community pharmacy-led STTT service consultations ($n = 11\,304$) between November 2018 and February 2020

		Total consultations: $N = 11\,304$
Service-user demographics		
Age (years) at consultation	Median (IQR)	25 (12–44)
	Range	6–94
Sex	Male	3685 (32.6)
	Female	7619 (67.4)
Factors related to engagement with the service		
Frequency of service use	One consultation	10 215 (90.4)
	Two consultations	948 (8.4)
	Three consultations	120 (1.1)
	Four consultations or more	21 (0.2)
Duration of the symptoms prior to accessing the service (days)	<1	937 (8.3)
	1–2	3671 (32.5)
	3–4	3652 (32.4)
	5–6	911 (8.1)
	≥7	2113 (18.7)
Referred to the pharmacy by:	GP/GP staff	5580 (49.4)
	Self-referral	5267 (46.6)
	Emergency services:	22 (1.8)
	GP OOH	80 (0.7)
	Emergency Department	2 (0.02)
	NHS 111	77 (0.7)
	Other healthcare professionals	202 (1.8)
	Other	96 (0.8)
Patient alternative action had the service not been available	Contact GP	10 482 (92.7)
	Contact other service:	504 (4.5)
	GP OOH	346 (3.1)
	Emergency Department	27 (0.2)
	111	52 (0.5)
	Other HCP	79 (0.7)
	Buy medication from pharmacy	162 (1.4)
	Do nothing	153 (1.4)
	Missing data	3 (0.03)
Factors related to the service availability		
Number of consultations in and out of hours	In-hours: number of consultations 09:00–18:00 Monday–Friday	10 238 (90.6)
	Out-of-hours: number of consultations outside 9:00–18:00 on weekdays or any time on Saturday or Sunday	1066 (9.4)
	Service outcomes	
Referred to other services following initial consultation	No referral was made	10 290 (91.0)
	GP	937 (8.3)
	GP OOH	51 (0.5)
	Emergency Department	9 (0.1)
	Other healthcare professional	17 (0.2)
Conditional referral (if deterioration or symptoms persist)	Referral guidance:	10 274 (90.9)
	Return to pharmacy	1232 (10.9)
	Seek medical advice	8920 (78.9)
	Make appointment with optometrist	3 (0.03)
	Other	119 (1.1)
	Perceived as none needed	1030 (9.1)

All results are *n* (%) unless otherwise specified.

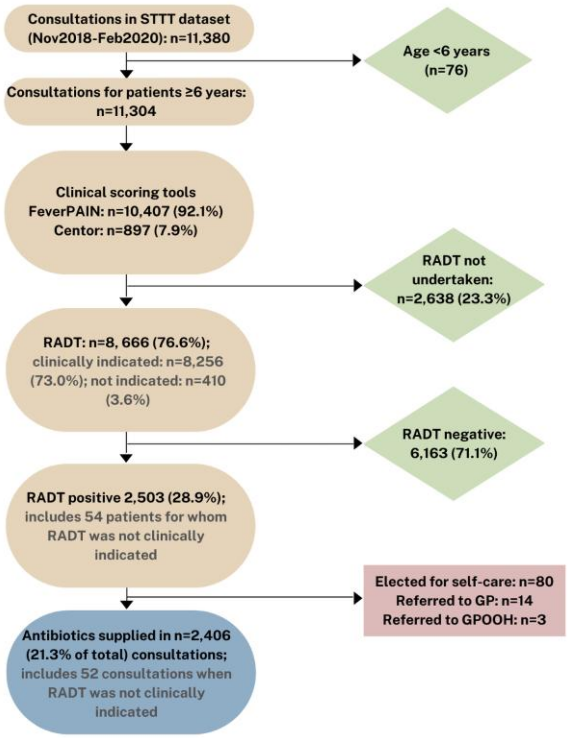

Figure 2. Overview of the STTT service outcomes in community pharmacies in Wales, between November 2018 and February 2020. This figure appears in colour in the online version of *JAC* and in black and white in the print version of *JAC*.

the majority of referrals were made by GPs (referral rate: GP 69.6% versus self-referral 26.1%). As provision and awareness of the service increased over time, so did the proportion of service users self-referring, with similar rates for GP referral and self-referral by February 2020 (GP 49.4% versus self-referral 46.6%) (Figure S1, available as Supplementary data at *JAC* Online). The majority (92.7%) of patients reported that they would have contacted their GP if the service had not been available. A total of 10 352 (91.6%) consultations took place in normal business hours (between 09:00 and 18:00 Monday to Friday) and 952 (8.4%) in the out-of-hours period (weekends, before 09:00 or after 18:00 Monday to Friday).

Service outcomes

Pharmacists managed 10 290 (91.0%) consultations in the pharmacy, referring only 937 service users (8.3%) to a GP, and 77 (0.8%) to Emergency Departments or GPOOH (Table 1). Higher rates of GP referrals were observed for service users presenting with a longer duration of symptoms (e.g. 6.3% referred to GP for symptoms <1 day; 6.2% for 1–2 days; 7.1% for 3–4 days; 9.3% for 5–6 days; 14.6% for 7 days or more). Safety netting was provided in all consultations and conditional referral guidance in 10 274 (90.9%) consultations.

Patients were found to meet threshold criteria for RADT in 8256 (73.0%) of 11 304 consultations (Figure 2). Of these, 2449 (29.6%) tested positive and 2354 (28.5%) were supplied antibiotics. Patients in 410 (3.6%) consultations had RADT despite not meeting clinical criteria for testing based on the service specification, of which 54 (46.2%) tested positive and 52 (12.7%) were supplied with antibiotics, bringing the overall antibiotic supply rate to 21.3% (2406/11 303) (Figure 2, Table 2). Only 97 (0.9%) service users had a positive RADT test but did not receive antibiotics.

Where free text was added by the pharmacist to explain RADT use that deviated from the service specification ($n=19$), the reasons given were pharmacists' professional judgement based on clinical symptoms or to exclude diagnosis before referring to the GP. These can be summarized as: tonsils appearing very inflamed, enlarged or with white spots ($n=7$); extended duration of symptoms ($n=4$); presence of very high fever ($n=3$); history of recurrent throat infections ($n=2$); GP asking pharmacist to take a swab ($n=2$); or taking swab just in case ($n=1$).

No pattern was observed in RADT positivity rates or antibiotic supply over time (Table 2). A high proportion (over 91%) of RADT was undertaken in service users in which it was clinically indicated and the proportion supplied with an antibiotic increased by score, e.g. 65.3% (434/665) of consultations with those with a FeverPAIN score of 5 were supplied with antibiotics (Table 3). For service users who were assessed using FeverPAIN, 1027 courses of antibiotics were supplied to those with clinical scores of 2 and 3 (42.7% of total antibiotic supply). A total of 2884 analgesic items were supplied (ibuprofen, $n=1478$; paracetamol, $n=1406$). In those with a FeverPAIN score of 5, analgesia was only supplied in 30.4% (202/665) whereas 72.4% (63/87) of service users presenting with a Centor score of 4 received analgesia.

Higher rates of antibiotic supply were observed in out-of-hours consultations when compared with in-hours (24.9% versus 20.9%, respectively, difference 4.0%, 95% CI = 1.3%–6.7%). This difference in antibiotic supply does not appear to be accounted for by the case-mix of service users in the two settings (Table S1).

Discussion

This is the first cross-sectional analysis of anonymized individual-level data from electronic pharmacy records from all consultations of the community pharmacy-led NHS STTT service in Wales. We described key characteristics of the service and service users. We found that the service was widely used, with 11 304 consultations completed, the majority of service users managed in the pharmacy, and an overall antibiotic supply rate of 21.3%. Without STTT being available in the study period, more than 96% of service users would have sought an appointment with a GP or in emergency settings.

The overall antibiotic supply at 21.3% from 16 months of the service was lower than both rates reported from consultations with GPs, where RADT is not routinely used (90% of practices prescribe antibiotics between 35% and 83% of sore throat consultations; median at 60%)[34] and rates from the STTT modified service delivery model during COVID-19 (63%, 95% CI: 55%–71%),[35] where the requirement for RADT was temporarily removed. These data contribute further to the body of evidence suggesting that a community pharmacy-led sore throat management pathway, with screening of service users using clinical scoring tools supported by RADT, may have a role in promoting access to primary care without adversely affecting antibiotic stewardship.

Table 2. Number of health boards (HBs) and pharmacies delivering the STTT service and the number of consultations, RADT use and antibiotics supply per month, between November 2018 and February 2020

Month	HBs with active STTT service (*n*)	Pharmacies with active STTT service (*n*)	Consultations (*n*)	RADT positive (*n*)	RADT positive % (95% CI)	Antibiotics supplied (*n*)	Antibiotic supplied % (95% CI)
November 2018	1	18	46	9	19.6 (10.7–33.2)	9	19.6 (10.7–33.2)
December 2018	2	33	191	49	25.7 (20.0–32.3)	48	25.1 (19.5–31.7)
January 2019	2	42	364	71	19.5 (15.8–23.9)	69	19.0 (15.3–23.3)
February 2019	2	52	589	119	20.2 (17.2–23.6)	115	19.5 (16.5–22.9)
March 2019	2	50	588	121	20.6 (17.5 to 24.0)	115	19.6 (16.6–23.0)
April 2019	2	56	607	144	23.7 (20.5–27.3)	140	23.1 (19.9–26.6)
May 2019	2	50	505	118	23.4 (19.9–27.2)	112	22.2 (18.8–26.0)
June 2019	2	50	445	95	21.3 (17.8–25.4)	92	20.7 (17.2–24.7)
July 2019	2	47	452	127	28.1 (24.2 to 32.4)	102	22.6 (19.0–26.6)
August 2019	2	44	403	98	24.3 (20.4–28.7)	95	23.6 (19.7–28.0)
September 2019	2	49	424	80	18.9 (15.4–22.9)	79	18.6 (15.2–22.6)
October 2019	2	49	511	109	21.3 (18.0–25.1)	106	20.7 (17.5–24.5)
November 2019	2	51	556	108	19.4 (16.4–22.9)	105	18.9 (15.8–22.3)
December 2019	5	86	1825	373	20.4 (18.7–22.3)	357	19.6 (17.8–21.4)
January 2020	6	106	1870	401	21.4 (19.6–23.4)	393	21.0 (19.2–22.9)
February 2020	7	134	1928	481	24.9 (23.1–26.9)	469	24.3 (22.5–26.3)

Table 3. Number (%) of consultations, RADT undertaken, antibiotics and analgesia supplied during the STTT service by FeverPAIN and Centor scores, between November 2018 and February 2020

Clinical scoring tool	Consultations[a]	RADT undertaken[a]	Antibiotics supplied[a]	Analgesia supplied[a]
FeverPAIN	10 406 (92.1 of total consultation)	8152 (78.3)	2233 (21.5)	2630 (25.3)
0	780 (7.5)	62 (7.9)	2 (0.3)	123 (15.8)
1	1407 (13.5)	273 (19.4)	31 (2.2)	316 (22.5)
2[b]	3061 (29.4)	2805 (91.6)	350 (11.4)	717 (23.4)
3[b]	2758 (26.5)	2672 (96.9)	677 (24.5)	742 (26.9)
4[b]	1735 (16.7)	1694 (97.6)	739 (42.6)	530 (30.5)
5[b]	665 (6.4)	646 (97.1)	434 (65.3)	202 (30.4)
Missing[c]	1	1		
Centor	897 (7.9 of total consultations)	513 (57.2)	173 (19.3)	254 (28.3)
0	86 (9.6)	1 (1.2)	0 (0)	16 (18.6)
1	163 (18.2)	5 (3.1)	0 (0)	37 (22.7)
2	196 (21.9)	69 (35.2)	19 (9.7)	52 (26.5)
3[b]	365 (40.7)	353 (96.7)	114 (31.2)	86 (23.6)
4[b]	87 (9.7)	85 (97.7)	40 (46.0)	63 (72.4)
Total	11 304 (100)	8665 (76.7)	2406 (21.3)	2884 (25.5)

[a]Percentage based on total consultations per score, unless indicated differently.
[b]RADT clinically indicated.
[c]FeverPAIN tool indicated as being used but no score recorded.

The antibiotic supply rate of 21.3 per 100 consultations is higher than the 9.8 per 100 consultations reported in the only other test and treat service researched in the UK,[26] a private service for service users aged 12 years and over. Thornley *et al.*[27] reported a lower percentage of patients who met the threshold clinical score for RADT (40.6% versus 73.0% in the current study), suggesting that service users presenting to the NHS-funded STTT service during the study period had more severe symptoms, which may indicate higher rates of bacterial infection than amongst those accessing a private service. Differences could be attributable to the characteristics of users of private health services and their different health-seeking behaviours; the different age profile of users — in our study, 14.3% of total antibiotics were supplied to service users aged 6–11 years; or demographic differences between the populations in the respective studies.

Over the study period, we found the median age of service users had decreased since the previous study (25 versus 29 years, respectively), although we cannot discount that differences in the age profile could have arisen from the different populations served by the additional pharmacies now providing STTT. In total, 4926 (43.6%) patients were in the age group 6–24 years. NICE guidance suggests that 50% of patients who present to GP surgeries with sore throat are in this age group.[18]

When the service started, the majority of patients were referred to the pharmacy by a GP. Within 16 months, self-referral became as common as GP referral. These findings suggest there is a high degree of confidence amongst GPs and patients that pharmacists can manage sore throat presentations and that service-user awareness and confidence grows over time.

A total of 10 482 service users would have sought an appointment with their GP and 425 with NHS 111, GPOOH or Emergency Department, had STTT not been available, suggesting that STTT availability potentially prevents a substantial number of appointments in primary care and emergency settings. At the same time as relieving pressure on the wider healthcare system, STTT also improved access to treatment, with 8.4% of all consultations taking place when GP surgeries were closed to the public, further highlighting that pharmacies' longer opening hours, including weekends, increased access for service users.[36] Results build on existing evidence that suggests pharmacy STTT incorporating RADT can reduce the need for GP consultations.[4]

Over the study period, pharmacists were able to manage more than 90% of people who consulted in the pharmacy, a rate similar to that reported in our previous study,[28] appropriately referring service users with longer duration of symptoms to other healthcare professionals. The higher referral rates for service users with symptoms lasting 3 days or more found in this study are consistent with other studies. Sykes *et al.*[6] reported that over 80% of pharmacists would refer the patient to a doctor following no improvement in sore throat within 3 days, and Hall *et al.*[37] found that 15% of patients initially managed by pharmacists reported seeing another healthcare professional because their symptoms had not resolved. We have previously reported that 12.3% of service users in the pilot sought advice from their GP and 2.7% from a hospital after their STTT consultation, but many of the reasons were unrelated to sore throat.[28] Wu *et al.*[38] recently published a systematic review on community pharmacist supply of systemic antimicrobials, finding that pharmacy-led services reduced unnecessary antibiotic prescribing for pharyngitis and reporting high rates of clinical improvement and low rates of re-treatment, adverse effects and further healthcare utilization.

Examining the prevalence of consultations by clinical scoring tool, 50.4% of patients assessed with FeverPAIN had scores between 3 and 5, similar to 49.6% of those assessed with Centor who had scores between 3 and 4. Further, we found that 1027 courses of antibiotics were supplied to service users with moderate scores of FeverPAIN 2 and 3, accounting for 42.6% of the total antibiotic supply. A FeverPAIN score of 2 and 3 is associated with a 34% to 40% likelihood of isolating *Streptococcus*,[19] suggesting that this cohort of patients is unlikely to suffer from any serious complications if an immediate antibiotic is not supplied. In addition, we have previously reported that when the service delivery model changed during COVID-19, removing the requirement for RADT, pharmacists supplied fewer antibiotics to service users with FeverPAIN score of 2 (lowest score where RADT was recommended pre-COVID), even though the numbers were very small and the reduction not statistically significant.[35] There is new evidence on the low rate of serious complications of upper respiratory tract infections in UK primary care.[39] The above supports changes to the delivery model of STTT for a subgroup of service users, with care to maintain safety as the service relies on a structured service specification. Some suggestions could be: re-consultation in pharmacy; delayed supply of antibiotics; or changing criteria for RADT by increasing the threshold score from FeverPAIN > 1 to FeverPAIN > 2 with a subsequent reduction in testing and prescribing. The latter strategy would require evaluation to ensure safety was not compromised for the potential small number of people that may have GABHS but a FeverPAIN score of ≤2. However, adverse outcomes are less likely given the overall low prevalence of serious complications, and the likelihood that GABHS with a low FeverPAIN score is related to carriage rather than infection.

The results of the study, as well as evidence from patients,[30] pharmacists[29] and the *de novo* economic analysis,[31] continue to build the body of evidence indicating that STTT is a high-value service that educates patients and improves access for them when seeking advice for sore throat management safely and in a way that promotes appropriate use of RADT and antibiotics. The service could substantially reduce workload and resource from a common illness in other heavily pressurized areas of primary and emergency care.

Strengths and limitations

This is the largest descriptive analysis of *Choose Pharmacy* data to date, related to STTT service provision. The dataset includes consultations from all LHBs, increasing the confidence that results are representative of the total population of Wales. *Choose Pharmacy* is recorded prospectively and is mostly structured, so all the parameters required for this study were recorded, with a negligible number of missing values ($n = 4$).

Choose Pharmacy is currently not capturing socioeconomic characteristics of service users, and any explanatory information on deviation from the pre-defined pathway relies on pharmacist free-text input. The analysis presented in this study is descriptive, with different types of modelling required to understand the impact of the service more broadly on primary care and to undertake a health economics evaluation.

Conclusions

Our findings suggest the pharmacy-led STTT service can be delivered at scale to align with a pre-specified pathway that promotes appropriate use of RADT and antibiotics. The service could substantially reduce workload from a common illness in other heavily pressurized areas of primary and emergency care. Further work to evaluate the service will include data linkage of pharmacy records to other national healthcare databases in Wales to enable analyses of trends pre-and post-STTT roll-out, and comparative effectiveness of sore throat management across different primary care services.

Acknowledgements

We would like to thank Ryan Southcott, Senior Support & Business Analyst in Digital Health and Care Wales, for his support with obtaining monthly data.

Funding

This work was supported by the Welsh Value in Health Centre.

Transparency declarations

None to declare.

Supplementary data

Figure S1 and Table S1 are available as Supplementary data at *JAC* Online.

References

1 Cohen JF, Pauchard J-Y, Hjelm N *et al*. Efficacy and safety of rapid tests to guide antibiotic prescriptions for sore throat. *Cochrane Database Syst Rev* 2020; CD012431. https://doi.org/10.1002/14651858.CD012431.pub2

2 Cook J, Hayward G, Thompson M *et al*. Oral corticosteroid use for clinical and cost-effective symptom relief of sore throat: study protocol for a randomized controlled trial. *Trials* 2014; **15**: 365. https://doi.org/10.1186/1745-6215-15-365

3 Dolk FCK, Pouwels KB, Smith DRM *et al*. Antibiotics in primary care in England: which antibiotics are prescribed and for which conditions? *J Antimicrob Chemother* 2018; **73** Suppl 2: ii2–10.

4 Essack S, Bell J, Burgoyne D *et al*. Point-of- care testing for pharyngitis in the pharmacy. *Antibiotics (Basel)* 2020; **9**: 11.

5 Cots JM, Alos JI, Barcena M *et al*. Recommendations for management of acute pharyngitis in adults. *Acta Otorrinolaringologica (English Edition)* 2015; **66**: 159–70. https://doi.org/10.1016/j.otoeng.2015.05.003

6 Sykes EA, Wu V, Beyea MM *et al*. Pharyngitis: approach to diagnosis and treatment. *Can Fam Physician* 2020; **66**: 251–7.

7 Kumar S, Little P, Britten N. Why do general practitioners prescribe antibiotics for sore throat? Grounded theory interview study. *BMJ* 2003; **326**: 138. https://doi.org/10.1136/bmj.326.7381.138

8 Shulman ST, Bisno AL, Clegg HW *et al*. Clinical practice guideline for the diagnosis and management of group A streptococcal pharyngitis: 2012 update by the Infectious Diseases Society of America. *Clin Infect Dis* 2012; **55**: e68–e102. https://doi.org/10.1093/cid/cis847

9 Razai M, Hussain K. Improving antimicrobial prescribing practice for sore throat symptoms in a general practice setting. *BMJ Qual Improv Rep* 2017; **6**: u211706.w4738. https://doi.org/10.1136/bmjquality.u211706.w4738

10 Dambha-Miller H, Everitt H, Little P. Clinical scores in primary care. *Br J Gen Pract* 2020; **70**: 163. https://doi.org/10.3399/bjgp20X708941

11 Willis BH, Coomar D, Baragilly M. Comparison of Centor and McIsaac scores in primary care: a meta-analysis over multiple thresholds. *Br J Gen Pract* 2020; **70**: e245–e54. https://doi.org/10.3399/bjgp20X708833

12 Gunnarsson R, Ebell MH, Wächtler H *et al*. Association between guidelines and medical practitioners' perception of best management for patients attending with an apparently uncomplicated acute sore throat: a cross-sectional survey in five countries. *BMJ Open* 2020; **10**: e037884. https://doi.org/10.1136/bmjopen-2020-037884

13 Stuhr JK, Lykkegaard J, Kristensen JK *et al*. Danish GPs' and practice nurses' management of acute sore throat and adherence to guidelines. *Fam Pract* 2019; **36**: 192–8. https://doi.org/10.1093/fampra/cmy059

14 Zahid M, Masoumeh G. Diagnostic methods, clinical guidelines, and antibiotic treatment for group A streptococcal pharyngitis: a narrative review. *Front Cell Infect Microbiol* 2020; **10**: 563627. https://doi.org/10.3389/fcimb.2020.563627

15 Lean WL, Arnup S, Danchin M *et al*. Rapid diagnostic tests for group A streptococcal pharyngitis: a meta-analysis. *Pediatrics* 2014; **134**: 771–81. https://doi.org/10.1542/peds.2014-1094

16 Cohen JF, Bertille N, Cohen R *et al*. Rapid antigen detection test for group A streptococcus in children with pharyngitis. *Cochrane Database Syst Rev* 2016; CD010502. https://doi.org/10.1002/14651858.CD010502.pub2

17 Little P, Hobbs FR, Moore M *et al*. Clinical score and rapid antigen detection test to guide antibiotic use for sore throats: randomised controlled trial of PRISM (primary care streptococcal management). *BMJ* 2013; **347**: f5806.

18 Gunnarsson R, Orda U, Elliott B *et al*. What is the optimal strategy for managing primary care patients with an uncomplicated acute sore throat? Comparing the consequences of nine different strategies using a compilation of previous studies. *BMJ Open* 2022; **12**: e059069. https://doi.org/10.1136/bmjopen-2021-059069

19 NICE. Sore Throat—Acute. 2021. https://cks.nice.org.uk/topics/sore-throat-acute/.

20 HM Government. Tackling Antimicrobial resistance 2019–2023. The UK's five-year national action plan. 2019. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1070263/UK_AMR_5_year_national_action_plan.pdf.

21 NICE. Rapid tests for group A streptococcal infections in people with a sore throat. Diagnostics guidance [DG38]. 2019. https://www.nice.org.uk/guidance/dg38.

22 Allison R, Chapman S, Howard P *et al*. Feasibility of a community pharmacy antimicrobial stewardship intervention (PAMSI): an innovative approach to improve patients' understanding of their antibiotics. *JAC Antimicrob Resist* 2020; **2**: dlaa089.

23 Gubbins PO, Klepser ME, Adams AJ *et al*. Potential for pharmacy-public health collaborations using pharmacy-based point-of-care testing services for infectious diseases. *J Public Health Manag Pract* 2017; **23**: 593–600. https://doi.org/10.1097/PHH.0000000000000482

24 Papastergiou J, Trieu CR, Saltmarche D *et al*. Community pharmacist-directed point-of-care group A *Streptococcus* testing: evaluation of Canadian program. *J Am Pharm Assoc* 2018; **58**: 450–6. https://doi.org/10.1016/j.japh.2018.03.003

25 Sinkala F, Parsons R, Sunderland B *et al*. A survey of the views and capabilities of community pharmacists in Western Australia regarding the rescheduling of selected oral antibiotics in a framework of pharmacist prescribing. *PeerJ* 2018; **5**: e4726. https://doi.org/10.7717/peerj.4726

26 Demoré B, Tebano G, Gravoulet J *et al*. Rapid antigen test use for the management of group A streptococcal pharyngitis in community pharmacies. *Eur J Clin Microbiol Infect Dis* 2018; **37**: 1637–45. https://doi.org/10.1007/s10096-018-3293-8

27 Thornley T, Marshall P, Howard P *et al*. A feasibility service evaluation of screening and treatment of group A streptococcal pharyngitis in community pharmacies. *J Antimicrob Chemother* 2016; **71**: 3293–9. https://doi.org/10.1093/jac/dkw264

28 Mantzourani E, Evans A, Cannings-John R *et al*. Impact of a pilot NHS-funded sore throat test and treat service in community pharmacies on provision and quality of patient care. *BMJ Open Qual* 2020; **9**: e000833. https://doi.org/10.1136/bmjoq-2019-000833

29 Mantzourani E, Hicks R, Evans A *et al*. Community pharmacist views on the early stages of implementation of a pathfinder sore throat test and treat service in Wales: an exploratory study. *Integr Pharm Res Pract* 2019; **8**: 105–13. https://doi.org/10.2147/IPRP.S225333

30 Mantzourani E, Cannings-John R, Evans A *et al*. Understanding the impact of a new pharmacy sore throat test and treat service on patient experience: a survey study. *Res Social Adm Pharm* 2021; **17**: 969–77. https://doi.org/10.1016/j.sapharm.2020.07.034

31 Health Technology Wales. Evidence Appraisal Report. Rapid antigen detection tests for group A streptococcal infections to treat people with a sore throat in the community pharmacy setting. 2020. https://healthtechnology.wales/wp-content/uploads/2020/02/EAR020-Rapid-antigen-detecting-tests.pdf.

32 StataCorp. *Stata statistical software: release 16*. StataCorp LLC, 2019.

33 Newcombe RG. Interval estimation for the difference between independent proportions: comparison of eleven methods. *Stat Med* 1998; **17**: 873–90. https://doi.org/10.1002/(SICI)1097-0258(19980430)17:8<873::AID-SIM779>3.0.CO;2-I

34 Gulliford MC, Dregan A, Moore MV *et al*. Continued high rates of antibiotic prescribing to adults with respiratory tract infection: survey of 568 UK general practices. *BMJ Open* 2014; **4**: e006245. https://doi.org/10.1136/bmjopen-2014-006245

35 Mantzourani E, Cannings-John R, Evans A *et al*. To swab or not to swab? Using point-of-care tests to detect group A *Streptococcus* infections as part of a sore throat test and treat service in community pharmacy. *J Antimicrob Chemother* 2022; **77**: 803–6. https://doi.org/10.1093/jac/dkab470

36 NHS England. Next steps on the NHS five year forward view. 2017. https://www.england.nhs.uk/wp-content/uploads/2017/03/NEXT-STEPS-ON-THE-NHS-FIVE-YEAR-FORWARD-VIEW.pdf.

37 Hall G, Cork T, White S *et al*. Evaluation of a new patient consultation initiative in community pharmacy for ear, nose and throat and eye conditions. *BMC Health Serv Res* 2019; **19**: 285. https://doi.org/10.1186/s12913-019-4125-y

38 Wu J, Khalid F, Langford BJ *et al*. Community pharmacist prescribing of antimicrobials: a systematic review from an antimicrobial stewardship perspective. *Can Pharm J (Ott)* 2021; **154**: 179–92. https://doi.org/10.1177/1715163521999417

39 Seeley A, Fanshawe T, Voysey M *et al*. Diagnostic accuracy of fever-PAIN and Centor criteria for bacterial throat infection in adults with sore throat: a secondary analysis of a randomised controlled trial. *BJGP Open* 2021; **5**: 0122. https://doi.org/10.3399/BJGPO.2021.0122