

Factors influencing clinician’s coherence with local antimicrobial guidelines in the management of sepsis

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Sir,

Sepsis is frequent, potentially fatal condition characterised by organ dysfunction as a result of a dysregulated host response to infection [1]. We estimated that the combined point-prevalence of sepsis is around 5.5% amongst hospital in-patients in Wales [2, 3]. It has been argued that rapid administration of an appropriately chosen antibiotic is the cornerstone of the effective treatment of sepsis [4].

Recently, a standardised sepsis screening tool and the Sepsis 6 treatment protocol has been rolled out across Wales [5]. However, the antibiotic prescribing element has been traditionally based on local guidance and antimicrobial resistance patterns [6]. Evidence suggests that incorrect antibiotic prescribing may lead to an increased emergence of antibiotic resistant organisms [7]. Therefore, it is crucial that local guidance is followed.

Our aim was to explore adherence to local guidelines and establish an understanding as to why, in clinical practice, prescribing patterns may differ.

We obtained data based on the antibiotic prescribing patterns across hospitals in Wales from the Defining Sepsis on the Wards Study which has been described previously in detail (ISCRTN: 86502304) [3]. Briefly, it was a point-prevalence study in every Welsh hospital over a 24-hour period on the 19/10/2016. Patients with National Early Warning

Score of 3 or above with clinical suspicion of infection were recruited following informed consent. Various demographic, care process and outcome data were collected, including antibiotic prescribing and administration.

We contacted the critical care outreach or acute intervention teams in the hospitals where this service is provided, to identify barriers to successfully implement early and appropriate antibiotic therapy as part of the Sepsis 6 initiative. Data were analysed using *Microsoft Excel*.

Within the study period there were similar numbers of patients with sepsis in each hospital (Table 1). Antibiotic treatment within one hour was administered at a variable rate, from 27% to 64%. In 35% of all cases of sepsis, the cause was unknown and within this sub-group the percentage of antibiotics prescribed was slightly higher, varying from 20% to 90%.

In accordance to local guidelines, antibiotic prescribing for patients with sepsis of unknown origin was correct in 22% of cases (Table 2). Out of the patients who did receive antibiotics, the majority of them received either an incorrect antibiotic regime (59%) or a partially correct antibiotic regime (19%).

There was significant inter-hospital variability in the correct prescription of antimicrobials. In many cases, partially correct antibiotic regimes were administered, as only one of the two suggested antibiotics were prescribed (Table 2).

Four key barriers to effectively implementing the antibiotic therapy in the Sepsis 6 initiative were identified:

1. Lack of education — understanding when to trigger the pathway.
2. Complexity of guidelines.
3. Lack of a leadership role — giving IV antibiotics requires communication between different healthcare professionals.
4. Practical issues — sourcing equipment or acute bed shortages.

Table 1. Patterns of antibiotic prescribing in sepsis across hospitals with outreach services in Wales

Hospital	Number of patients with sepsis	% of patients with sepsis who received antibiotics	% of patients with sepsis of unknown origin	% of patients with sepsis of unknown origin who received any antibiotics
Morrison Hospital	37	27.0	35.1	30.8
Princess of Wales Hospital	39	53.9	35.9	78.6
Prince Charles Hospital	39	53.9	35.9	57.1
Royal Glamorgan Hospital	38	44.7	36.8	57.1
Royal Gwent Hospital	38	57.9	29.0	90.9
University Hospital of Wales	33	63.6	30.3	70.0
Wrexham Maelor Hospital	34	58.8	44.1	66.7
Nevil Hall Hospital	33	54.6	30.3	20.0
Average	36	51.8	34.7	58.9

Table 2. Percentage of times antibiotic prescribing was correct, partially correct or incorrect, based on local guidelines

Hospital	Patients with sepsis of unknown origin who did receive antibiotics		
	% of time correct antibiotic regime given	% of time partially correct antibiotic regime given	% of time incorrect antibiotic regime given
Morrison Hospital	75	0	25
Princess of Wales Hospital	27	0	73
Prince Charles Hospital	0	50	50
Royal Glamorgan Hospital	13	75	13
Royal Gwent Hospital	0	0	100
University Hospital of Wales	0	29	71
Wrexham Maelor Hospital	60	0	40
Nevil Hall Hospital	0	0	100
Average	22	19	59

NB — antibiotic prescribing was partially correct in cases where local guidelines recommended two different antibiotics and only one was prescribed

Despite ongoing awareness campaigns and generalised belief that sepsis care is improving, none of the hospitals had clinicians that prescribed antibiotics in every case.

Compliance was reduced when guidelines became more detailed and critical care outreach teams identified the complexity of administering intravenous antibiotics as one of the barriers to successfully implementing the Sepsis 6 bundle. Others identified barriers included; inadequate education, lack of a leadership role within departments and practical issues such as bed space and access to equipment.

Evidence suggests that early antibiotic use may be associated with a better outcome in sepsis [8]. Whilst only half of our patients received antibiotics in the first hour, this is better than the 35–40% observed in a recent cluster-randomised trial [8]. Unfortunately, those who did receive antibiotics, prescribing was often inconsistent with local guidelines. Previously it was found that less than half of doctors use local guidelines when choosing an appropriate antibiotic but instead use the British National Formulary due to the perceived validity of a national guideline [9].

Compliance with local guidelines is influenced by key factors, including the doctor's knowledge, attitude and behaviour [10]. Poor guideline adherence could also result from inadequate dissemination of the recommended information [9]. We suggest that the knowledge of healthcare professionals is one of the most important aspects and it is therefore vital that they are trained in the recognition and early management of sepsis.

A multifaceted approach is needed to improve compliance with local guidelines. This may include the following: simplification of existing guidelines, their dissemination and reinforcement; the recruitment of local champions, frequent educational sessions for healthcare professionals and having a tangible goal or outcome that is regularly audited i.e. percentage of antibiotics correctly prescribed in cases of sepsis [8].

In conclusion, this study has highlighted the lack of coherence with local antimicrobial guidelines in hospitals across Wales. Our study's results suggest that the success of quality improvement in sepsis care depends on the existence of an embedded patient safety-centered local leadership and the capability for interdisciplinary cooperation.

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References:

1. Singer M, Deutschman CS, Seymour CW, et al. Sepsis Definitions Task Force. Developing a new definition and assessing new clinical criteria for septic shock: for the Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). *JAMA*. 2016; 315(8): 775–787, doi: [10.1001/jama.2016.0289](https://doi.org/10.1001/jama.2016.0289), indexed in Pubmed: [26903336](https://pubmed.ncbi.nlm.nih.gov/26903336/).
2. Szakmany T, Lundin RM, Sharif B, et al. Welsh Digital Data Collection Platform Collaborators. Sepsis prevalence and outcome on the general wards and emergency departments in Wales: results of a multi-centre, observational, point prevalence study. *PLoS One*. 2016; 11(12): e0167230, doi: [10.1371/journal.pone.0167230](https://doi.org/10.1371/journal.pone.0167230), indexed in Pubmed: [27907062](https://pubmed.ncbi.nlm.nih.gov/27907062/).
3. Szakmany T, Pugh R, Kopczynska M, et al. Welsh Digital Data Collection Platform collaborators. Defining sepsis on the wards: results of a multi-centre point-prevalence study comparing two sepsis definitions. *Anaesthesia*. 2018; 73(2): 195–204, doi: [10.1111/anae.14062](https://doi.org/10.1111/anae.14062), indexed in Pubmed: [29150856](https://pubmed.ncbi.nlm.nih.gov/29150856/).
4. Rhodes A, Evans LE, Alhazzani W, et al. Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock: 2016. *Crit Care Med*. 2017; 45(3): 486–552, doi: [10.1097/CCM.0000000000002255](https://doi.org/10.1097/CCM.0000000000002255), indexed in Pubmed: [28098591](https://pubmed.ncbi.nlm.nih.gov/28098591/).
5. Hancock C. A national quality improvement initiative for reducing harm and death from sepsis in Wales. *Intensive Crit Care Nurs*. 2015; 31(2): 100–105, doi: [10.1016/j.iccn.2014.11.004](https://doi.org/10.1016/j.iccn.2014.11.004), indexed in Pubmed: [25604031](https://pubmed.ncbi.nlm.nih.gov/25604031/).
6. Heginbotham M, Howe R, McArtney B, Parry-Jones J, Mark S, Szakmany T. The microbiology of severe sepsis. *Public Health Wales*. 2013. <http://www.wales.nhs.uk/sites3/page.cfm?orgld=457&pid=28906>.
7. Marston HD, Dixon DM, Knisely JM, et al. Antimicrobial Resistance. *JAMA*. 2016; 316(11): 1193–1204, doi: [10.1001/jama.2016.11764](https://doi.org/10.1001/jama.2016.11764), indexed in Pubmed: [27654605](https://pubmed.ncbi.nlm.nih.gov/27654605/).
8. Bloos F, Rüdell H, Thomas-Rüdell D, et al. MEDUSA study group. Effect of a multifaceted educational intervention for anti-infectious measures on sepsis mortality: a cluster randomized trial. *Intensive Care Med*. 2017; 43(11): 1602–1612, doi: [10.1007/s00134-017-4782-4](https://doi.org/10.1007/s00134-017-4782-4), indexed in Pubmed: [28466151](https://pubmed.ncbi.nlm.nih.gov/28466151/).
9. Ali MH, Kalima P, Maxwell SRJ. Failure to implement hospital antimicrobial prescribing guidelines: a comparison of two UK academic centres. *J Antimicrob Chemother*. 2006; 57(5): 959–962, doi: [10.1093/jac/dkl076](https://doi.org/10.1093/jac/dkl076), indexed in Pubmed: [16531431](https://pubmed.ncbi.nlm.nih.gov/16531431/).
10. Teixeira Rodrigues A, Roque F, Falcão A, et al. Understanding physician antibiotic prescribing behaviour: a systematic review of qualitative studies. *Int J Antimicrob Agents*. 2013; 41(3): 203–212, doi: [10.1016/j.ijantimicag.2012.09.003](https://doi.org/10.1016/j.ijantimicag.2012.09.003), indexed in Pubmed: [23127482](https://pubmed.ncbi.nlm.nih.gov/23127482/).

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