

What Stops Doctors Switching from Intravenous to Oral Antibiotics?

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Abstract

Aims

To explore doctors' perceptions of the motivators and barriers to complying with intravenous to oral switch antibiotic guidelines in a Model 4 Irish hospital.

Methods

A cross-sectional study was carried out amongst doctors attending hospital-wide educational sessions in November 2018 via a validated paper-based survey post ethical approval. Data were independently analysed using SPSS.

Results

One hundred and seventy four doctors of all grades and a variety of specialties participated. Respondents felt they were aware of the local intravenous to oral switch criteria but expressed they required prompts to consider switching to oral agents when appropriate, inclusive of alert stickers in the Kardex and medical notes as well as reminders from nursing and pharmacy staff. Other interventions to assist with improved decision-making included further education to junior doctors on the benefits of an intravenous to oral switch, electronic prescribing, and better accessibility to laboratory results.

Conclusion

Results will assist in implementing quality improvement initiatives to increase the rate of guideline compliance.

Introduction

Inappropriate use of antimicrobials can contribute significantly to the emergence and spread of antimicrobial resistance (AMR)¹⁻³. Robust antimicrobial stewardship interventions ensure appropriate use of antimicrobial agents thereby optimising patient care, minimising unintended consequences of antimicrobial use, and reducing healthcare costs⁴. One of these interventions include switching from intravenous (IV) to oral (PO) antimicrobial therapy when appropriate. Benefits of an early switch include: early discharge from hospital leading to a reduction in length of hospital stay, the risk of acquiring a hospital infection and cost; more comfort for the patient as they are administered a PO antimicrobial; and less time for nurses reconstituting and administering IV antimicrobials⁵⁻⁸.

A prospective clinical audit to determine compliance with local antimicrobial IV to PO switch guidelines for medical patients from day three of admission over a three-week period was previously conducted in this Model 4 Irish hospital in October 2017⁹. Ninety-six patients were included in data analysis. Twenty-four percent of IV-PO switches were delayed and could have been switched on average two days earlier. This rate was higher than the national annual antimicrobial point prevalence survey (PPS) of 44 Irish hospitals conducted in 2018 which identified 13% of IV antimicrobials could have switched to a PO formulation¹⁰. As a follow on from results of this audit, the aim of the

current study was to evaluate doctors' perceptions of the motivators and barriers to complying with the antibiotic IV to PO switch hospital guidelines. We also wanted to identify quality improvement interventions to improve compliance. These guidelines are freely available and accessible on smart phones and via the local hospital intranet.

Methods

An anonymous cross-sectional paper-based questionnaire on the motivators and barriers to complying with antibiotic IV to PO switch hospital guidelines was developed by the investigators and independently validated. The questionnaire included a range of questions on perceived determinants of antibiotic decision-making with regard to switching from IV to PO antibiotics using a 5-point Likert-scale as well as a qualitative free text question on additional interventions which may improve compliance. Questionnaires were distributed to medical prescribers over a two-week period in November 2018 at hospital-wide teaching sessions without any interference from investigators and collected thereafter once complete [Table 1]. Data were analysed using SPSS. Ethical approval was obtained from the hospitals clinical research ethics committee and the audit was registered with the clinical audit department prior to commencing the study.

1. Grade: Intern SHO Reg Consultant
2. Number of years working since graduation:
1-5 years 6-10 years 11-15 years 16-20 years >20 years
3. Number of years working in this hospital:
Less than 6 months 6 months – 1 year 1-2 years 3-4 years >5 years
4. Your speciality: Medicine Surgery ED Obs/Gynae Paeds ICU

What stops you switching from IV to PO antibiotics

Please tick **ONLY ONE** option for each statement in the box provided:

1. You do not always review IV antibiotics **daily** on ward rounds
Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree
2. You are not aware of the antibiotic IV to PO switch hospital guidelines
Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree
3. You are unable to easily access the IV to PO switch hospital guidelines
Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree
4. You are not aware of equivalent PO antibiotics following IV antibiotic courses
Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree
5. You frequently doubt the extent of PO **absorption** which prevents an IV to PO switch
Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree
6. You are worried that PO antibiotics will not treat the infection effectively
Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree
7. Nurses do not join the doctors' ward rounds routinely and thus no one is there to question the need for continued IV antibiotics
Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree
8. You have not had education on the benefits of switching from IV to PO antibiotics
Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree
9. You feel you need a more senior colleague to make the decision to switch to PO antibiotics
Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree
10. You feel you need case specific advice from microbiology/infectious diseases before switching to PO antibiotics
Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree
11. An alert sticker **in the clinical notes** would prompt you to consider an IV to PO switch
Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree
12. An alert sticker in the **Kardex** would prompt you to consider an IV to PO switch
Strongly agree Agree Neither agree nor disagree Disagree Strongly disagree

What additional interventions do you feel may improve your compliance with the antibiotic IV to PO switch hospital guidelines?

Table 1: Anonymous survey for medical prescribers on antibiotic IV to PO switch hospital guidelines

Results

Participant characteristics

One hundred and seventy-four doctors participated out of a total of 425 whole time equivalent doctors employed in the hospital. The majority of respondents were Senior House Officers (SHOs) [30.5% (n=53)] and Registrars [29.3% (n=51)], followed by Consultants [20.7% (n=36)] and Interns [19.5% (n=34)]. Respondents had mostly worked for one to five years since graduation [55.2% (n=96)] and the majority were working in this hospital for one year or less [58.6% (n=102)]. Maximum respondents were from the department of medicine [46.6% (n= 81)] and surgery [21.3% (n= 37)] followed by anaesthesia/critical care [10.3% (n=18)], paediatrics [8% (n=14)], emergency medicine [5.7% (n=10)], obstetrics/gynaecology [4.6% (n=8)], public health [1.1% (n=2)], and general practice [0.6% (n=1)].

Motivators and barriers to complying with antibiotic IV to PO switch hospital guidelines

A substantial proportion of participants [58.1% (n=101)] felt IV antibiotics were reviewed daily on ward rounds. Most respondents [64.9% (n=113)] agreed or strongly agreed that they were aware of the antibiotic IV to PO switch hospital guidelines and 60.4% (n=105) felt these guidelines were easily accessible. Free text comments included:

“When on call guidelines from primary team would help, often unsure of need for IV antibiotics from medical notes, clear indication for why someone is on IV, fill out anticipated stop date” (Registrar, Medicine)

“Guidelines should be attached to Kardex so easy to switch over” (Registrar, Surgery)

Approximately two-thirds of participants [69.5% (n=121)] felt they were aware of equivalent PO antibiotics and 66.1% (n=115) did not believe that doubts regarding the extent of PO absorption prevented them from switching from IV to PO agents. However, some participants [37.4% (n=65)] expressed concern that PO antibiotics may not treat infections effectively.

There was a mixed response as to whether nurses routinely participate on ward rounds with doctors and question the need for continuing IV antibiotics [Figure 1]. Free text comments included:

“Nurses should be comfortable questioning doctors” (Intern, Surgery)

“Pharmacy/nursing prompt helpful” (Registrar, Medicine)

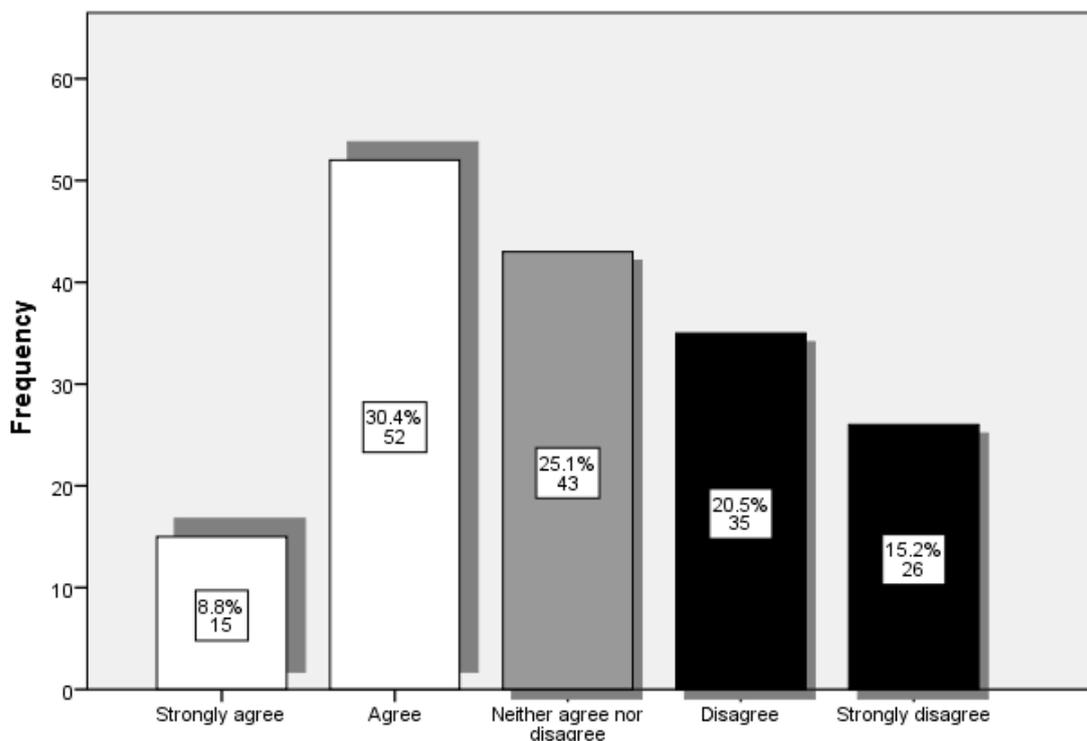


Figure 1: Nurses not joining doctor's ward rounds routinely and thus no one questioning need for continued IV antibiotics(n=171)

There was also a mixed response as to whether participants felt they had been educated on the benefits of switching from IV to PO antibiotics [Figure 2]. Free text comments included:

“More reminders, further education on effectiveness of oral antibiotics” (Intern, Surgery)

“Increase awareness from all members of team, maybe repeated education sessions, case conferences, BST, intern teaching, online prescribing system with pop up reminder to consider switch” (Registrar, Medicine)

“Make all new NCHDS who start working here fully aware of app and download. I think it is most commonly used by (affiliated University) graduates” (SHO, Emergency Department)

“Education on benefits of oral switch and disadvantages of iv for nurses and doctors” (Consultant, Medicine)

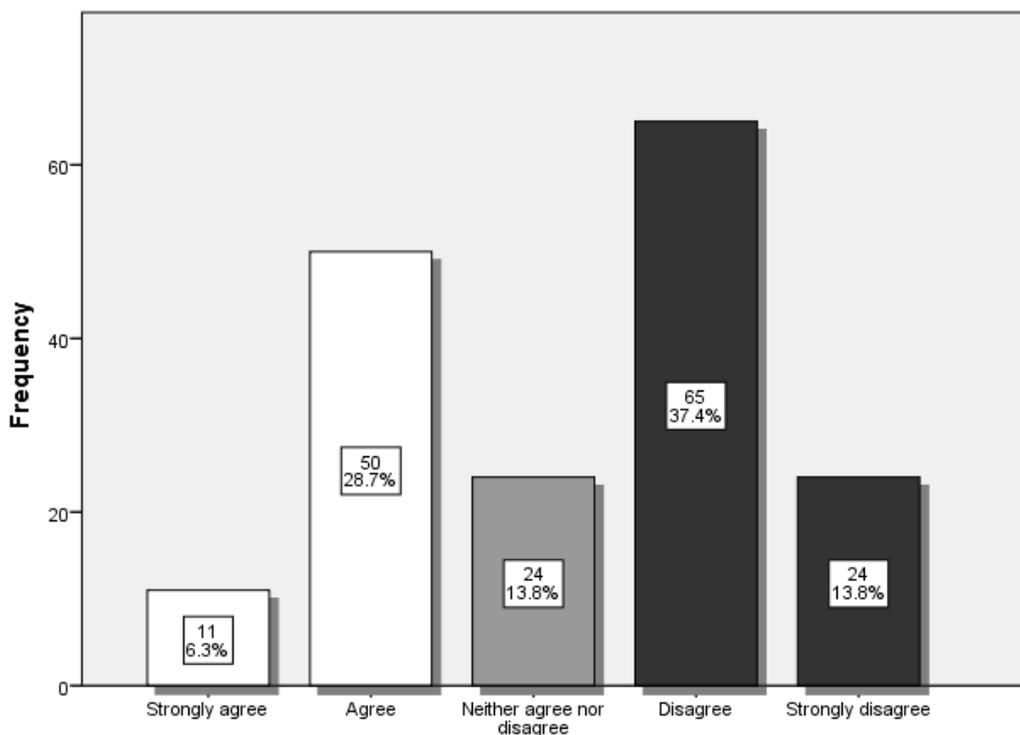


Figure 2: Did not have education on the benefits of switching from IV to oral antibiotics (n=174)

Seventy participants (40.5%) felt they needed a more senior colleague to make the decision to switch to PO antibiotics [35% (n=61)], most of which belonged to a junior grade [Intern and SHO: 87.1% (n=61)]. Thirty Nine (22.4%) doctors expressed that they needed case specific advice from microbiology or infectious diseases before switching to PO antibiotics, again most of whom belonged to a junior grade [Intern and SHO: 58.9% (n=23)]. Free text comments included:

“Many IV initiations at night inappropriate and should be discussed with more senior colleagues” (Consultant, Medicine)

“Interns don't feel encouraged to make decisions, we worry that registrars will disagree with these decisions, antibiotic prescribing registrar directed” (Intern, Medicine)

Most participants believed an alert sticker in the Kardex [70.1% (n=122)] [Figure 3] and clinical notes [66.1% (n=115)] would prompt them to consider an IV to PO switch

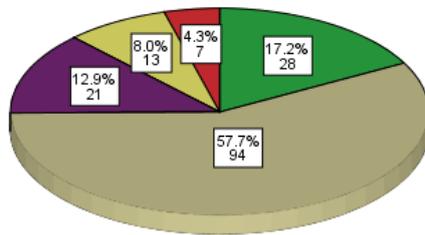
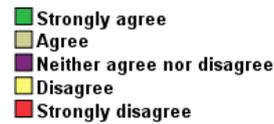


Figure 3: Alert sticker in Kardex would prompt IV to PO switch (n=163)

Free text comments included:

“Sticker good idea, on Kardex best” (Consultant, Paediatrics)

Additional interventions participants felt may improve compliance with the IV to PO switch guidelines

Some participants believed an IT prescribing system would be of benefit as well as better availability of blood results.

“Electronic prescribing may help” (Consultant, Medicine)

“Early availability of blood results such as crp, wbc, lab could be alerted with an addition in the blood request form” (Registrar, Medicine)

“Access to sensitivities on blood cultures/urine at weekends” (Consultant, Obstetrics/Gynaecology)

Pharmacy notes in both the Kardex and medical notes indicating suitability and recommendations for an IV to PO switch was also viewed as a potential intervention to improve compliance with guidelines by some respondents in the study:

“Green pen note in notes not in Kardex, perhaps both as nurses see Kardex and may remind team on ward round” (Intern, Surgery)

“Pharmacy notes in Kardex indicating that IV course is recommended by guidelines” (SHO, Medicine)

“IT prescribing, pharmacist round with team” (SHO, Medicine)

Discussion

This study ascertained the motivators and barriers to complying with the local antimicrobial IV to PO switch criteria amongst medical prescribers in a Model 4 Irish hospital. Some studies have previously been undertaken to evaluate the factors influencing clinical practice of switching IV to PO antibiotics^{11, 12}. This study was unique as it was done on Irish doctors. The study population included all grades of doctors and was mostly representative of medical prescribers with limited work experience both in this hospital and since graduation which may impact on decision-making to switch from IV to PO antibiotics. Public health doctors and General Practitioners attending educational sessions also participated in the study. The majority of participants felt IV antibiotics were reviewed daily suggesting doctors are mindful of the IV route and noncompliance with switch guidelines is not related to lack of recognition of this route of administration. Similarly, most participants were aware of the local switch criteria, PO equivalents, and felt the guidelines were easily accessible.

Whilst the majority of doctors believed the extent of PO absorption did not prevent them from switching, some doctors were concerned that PO antibiotics may not treat infections effectively and felt they lacked education on the benefits

of switching from IV to PO antibiotics. This is similar to other studies which identified doctors felt IV antibiotics held additional potency over PO antibiotics and were uncertain as to whether PO alternatives achieved effective tissue levels despite evidence supporting the efficacy of PO antibiotics in certain situations^{11,13-14}. In addition, most junior doctors felt they needed more senior advice or case specific advice from microbiology/infectious diseases. Other studies have found junior doctors were not comfortable switching from IV to PO antibiotics and clinical inexperience was identified as a driver of increased IV antibiotic use and inappropriate antibiotic decision-making^{11, 15-16}. Further senior medical support around antibiotic switch decision-making and education targeting junior medical prescribers is therefore warranted.

The study highlighted that medical prescribers recognise the value of nurse participation on ward rounds with doctors and their questioning of the need for continuing IV antibiotics. Increased ward round attendance and reminders from nurses on potential patient suitability for a switch may therefore be of benefit.

Two related interventions which participants felt would prompt them to consider switching from IV to PO antibiotics were alert stickers in both the Kardex and clinical notes. Other interventions suggested included notes from clinical pharmacists indicating suitability for a switch, the introduction of a hospital-wide electronic prescribing system and better availability of laboratory results.

Strengths of the study include it was original, highly powered, anonymous and independently developed, analysed and interpreted. In addition, suggested interventions to improve guideline compliance originated from medical prescribers themselves therefore implementation of such interventions are more likely to be successful than interventions originating from the antimicrobial stewardship team alone.

A limitation is that the study was conducted in one centre. However, the vast majority of participants were non-consultant hospital doctors who generally rotate every 6 to twelve months in the Irish healthcare system indicating results may be representative of other Irish hospitals and can be transferable.

To conclude, adherence to the antibiotic IV to PO switch hospital guidelines can improve patient outcomes and is a critical component of antimicrobial stewardship. This study demonstrated doctors were aware of the local IV to PO switch criteria but the motivator they identified as most likely to increase their compliance with IV to PO switch was specific prompts to execute the decision to switch to PO antibiotics. Results have been disseminated to key stakeholders inclusive of recommendations for electronic prescribing, better availability of laboratory results and senior medical support for antibiotic decision-making. Further education for junior doctors on the benefits of switching from IV to PO antibiotics and for nurses and pharmacists on prompting doctors to switch when appropriate is being carried out along with implementation of alert stickers in the Kardex and medical notes. The annual antimicrobial PPS will be repeated in this hospital to determine guideline compliance and the effect of these quality improvement interventions.

Conflicts of Interest Statement:

The authors have no conflicts of interest to disclose.

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References:

1. Zarb P, Amadeo B, Muller A, Drapier N, Vankerckhoven V, Davey P, Goossens H. ESAC-3 Hospital Care Subproject Group. Identification of targets for quality improvement in antimicrobial prescribing: the web-based ESAC Point Prevalence Survey 2009. *J Antimicrob Chemother.* 2011;66(2):4439. <https://doi.org/10.1093/jac/dkq430>
2. Hecker MT, Aron DC, Patel NP, Lehmann MK, Donskey CJ. Unnecessary use of antimicrobials in hospitalized patients: current patterns of misuse with an emphasis on the antianaerobic spectrum of activity. *Arch Intern Med.* 2003;163(8):972-8. <https://doi.org/10.1001/archinte.163.8.972>
3. Willemsen I, Bogaers-Hofman D, Winters M, Kluytmans J. Correlation between antibiotic use and resistance in a hospital: temporary and ward-specific observations. *Infection.* 2009;37(5):432. <https://doi.org/10.1007/s15010-009-8325-y>
4. HSE Health Protection Surveillance Centre, on behalf of the Strategy for the Control of Antimicrobial Stewardship in Ireland (SARI). Guidelines for Antimicrobial Stewardship in Hospitals in Ireland. SARI Hospital Antimicrobial Stewardship Working Group. December 2009.
5. <https://www.hpsc.ie/a-z/microbiologyantimicrobialresistance/infectioncontrolandhai/guidelines/File,4116,en.pdf>
6. Ramirez JA, Vargas S, Ritter GW, Brier ME, Wright A, Smith S, Newman D, Burke J, Mushtaq M, Huang A. Early switch from intravenous to oral antibiotics and early hospital discharge. *Arch Intern Med* 1999; 159: 2449-2454.
7. Tager IB, Ginsberg MB, Ellis SE, Walsh NE, Dupont I, Simchen E, Faich GA. An epidemiological study of the risks associated with peripheral intravenous catheters. *Am J Epidemiol* 1983;118(6):839-851.
8. Murdaugh LB. Competence assessment tools for health-system pharmacies. 5th Ed 2015.
9. Septimus EJ, Owens RC. Need and potential of antimicrobial stewardship in community hospitals. *Clin Infect Dis.* 2011;53(Suppl 1):8–14.
10. Hogan-Murphy D, Ni Riain U, Mullin F. A baseline prospective audit on compliance with antimicrobial intravenous to oral switch guidelines in a Model 4 teaching hospital. ResearchGate 2018. https://www.researchgate.net/publication/324280173_A_baseline_prospective_audit_on_compliance_with_antimicrobial_intravenous_to_oral_switch_guidelines_in_a_Model_4_teaching_hospital
11. Hogan-Murphy D, Mannion C, Oza A Cunney R. Annual Antimicrobial Point Prevalence Survey of Hospital Prescriptions in Ireland 2018. ResearchGate 2019.
12. https://www.researchgate.net/publication/329568805_Annual_Antimicrobial_Point_Prevalence_Survey_of_Hospital_Prescriptions_in_Ireland_2018
13. Broom J, Broom A, Adams K, Plage S. What prevents the intravenous to oral antibiotic switch? A qualitative study of hospital doctors' accounts of what influences their clinical practice. *J Antimicrob Chemother* 2016; 71: 2295 – 2299
14. Warburton J, Hodson K, James D. Antibiotic intravenous-to-oral switch guidelines: barriers to adherence and possible solutions. *The International journal of pharmacy practice.* 2014 Oct;22(5):345-53.
15. Benjamin L, Cotte FE, Philippe C, Mercier F, Bachelot T, Vidal-Trécan G. Physicians' preferences for prescribing oral and intravenous anticancer drugs: a Discrete Choice Experiment. *Eur J Cancer* 2012; 48: 912–20.
16. Lee SL, Azmi S, Wong PS. Clinicians' Knowledge, Beliefs and Acceptance of Intravenous-to-oral Antibiotic Switching, Hospital Pulau Pinang. *Med J Malaysia.* 2012; 67(2):190-8.
17. De Souza V, MacFarlane A, Murphy AW, Hanahoe B, Barber A, Cormican M. A qualitative study of factors influencing antimicrobial prescribing by non-consultant hospital doctors. *J Antimicrob Chemother* 2006; 58: 840–3.
18. Mattick K, Kelly N, Rees C. A window into the lives of junior doctors: narrative interviews exploring antimicrobial prescribing experiences. *J Antimicrob Chemother* 2014; 69: 2274 –83.