Steward.ai

Empowering Clinicians Towards Precision Antibiotic Therapy

Dr William Bolton

20th May 2025

 Steward .ai	≡
Antibiotic IV to oral switch decision support	
This product is still in Beta version . Please share y feedback at william.bolton@imperial.ac.uk. Thanks your support!	our s for
Diagnosis	i
Cellulitis	
Intestinal infection	
Pneumonia	
Sepsis	
Urinary tract infection	
Other infection	
Duration	(i)
0 days	
	S
() ① ①	ſ





42,800 deaths a year in the UK

Costs the NHS **£230m** a year

>30% of antibiotic prescriptions are inappropriate

Steward.ai



Antimicrobial stewardship

A coordinated effort and set of practices aimed at **optimising antimicrobial use** and **prolonging their therapeutic life**, to improve infection patient **outcomes** while minimizing the development of **antimicrobial resistance**





Oral antibiotics have numerous advantages, but switching from IV treatment is complex and under-researched.

FLSEVIEI





One key challenge of stewardship is determining when to switch antibiotics from IV-to-oral administration

Patient A Clinical Infection in Practice Jume 16 November 2022 10020 Clinical Audits/Service improvements Oral step-down for Review March 30, 2020 bacteraemia: An or 3 days **Evaluation of a Paradigm Shift From** stewardship? Intravenous Antibiotics to Stephen Platts ^a, Brendan A.I. Payne Ulrich Schwab Therapy for the 1 The American Journal of Medicine Endocarditis A Narrative Revie Patient B Oral Is the New IV. Challenging Decades of Brad Spellberg, MD¹; Henry F. Chambers, Blood and Bone Infection Dogma: A Systematic Review 5 days Noah Wald-Dickler MD.^{a b c}, Paul D. Holtom MD.^{a b}, Matthew C. Phillips MD.^a, ert M. Centor MD ^{d e}, Rachael. A. Lee MD ^{d e}, Rachel Baden MD ^a, Brad Spellberg MD ^a

> Oral therapy are often **non-inferior** to IV with fewer side effects, decreased nursing workload, lower costs, reduced climate impact and improved patient comfort

There is a **poor understanding** of the factors that facilitate or inhibit an individual from receiving oral therapy

Hypothesis

A machine learning model using routinely collected clinical parameters could predict whether a patient could be suitable for switching from IV-to-oral antibiotics on any given day

Machine learning models were trained to predict a patient's route of administration and evaluated across numerous datasets.





nature communications



Models achieve generalisable performance across a range of datasets and patient populations.

2nd threshold

0.05 (SD 0.02)

IVOS criteria

0.28



		Wethe	results	results	baseline
MIN	MIMIC	AUROC	0.78 (SD 0.02)	0.69 (SD 0.03)	0.66
		FPR	0.25 (SD 0.02)	0.10 (SD 0.02)	0.43
		Metric	1 st threshold results	2 nd threshold results	IVOS criteria baseline
	elCU.	AUROC	0.72 (SD 0.02)	0.65 (SD 0.05)	0.55

Motric

FPR

1ST threshold

0.24 (SD 0.04)



	Metric	Retrospective dataset	Prospective dataset
Imperial College Healthcare	AUROC	0.79 (SD 0.01)	0.77
	FPR	0.21 (SD 0.03)	0.20

nature communications











Personalized patient decisions



Simple and easy to use



Explainable, safeguarded AI



Robust clinical evaluation



Save hospitals money

> Steward .ai	=
Antibiotic IV to oral switch decision support	
This product is still in Beta version . Please share eedback at william.bolton@imperial.ac.uk. Thar rour support!	e your hks for
Diagnosis	(j)
Cellulitis	
Intestinal infection	
Pneumonia	
Sepsis	
Urinary tract infection	
Other infection	
Duration	(j)
0 days	
☐ steward-ai.co.uk	S
	C





Literature

reviews

We are beginning a real-world pilot at Imperial and are looking to partner with other healthcare and MedTech organisations.







Dr Tim Rawson

Professor Pantelis Georgiou

Professor Alison Holmes

Professor Mark Gilchrist

Richard Wilson

Charn Sangvirojkul

James Skilton



NHS Imperial College Healthcare

Health

centre for antimicrobial optimisation





Steward.ai

Join us to Tackle Antimicrobial Resistance Through Precision Antibiotic Therapy

Dr William Bolton

Personal Website











Research into AI and data-driven approaches towards antimicrobial stewardship are lacking.



Using AI to optimize antimicrobial prescribing raises important ethical questions.

How can a **moral balance** be obtained between the needs of an **individual** patient and those of **wider and future society**?



Variables Description		Exemplar of starting antimicrobial treatment	Corresponding ad-hoc utility value
Intensity How strong is the pleasure?		Treating a relevant infection with antimicrobials has the potential to save that person's life	Highly positive utility
Duration	How long will the pleasure last?	Any extension of life is immeasurable while it is reasonable AMR will continue in the near-term future	Positive utility
Certainty or uncertainty	How likely or unlikely is it that the pleasure will occur?	Limited information often means treatment may or may not be helpful and there is always an inherent risk of developing AMR	Neutral utility, without more information
Propinquity	How soon will the pleasure occur?	Treatment can be effective immediately however the same is true for the evolution of AMR	Neutral utility, without more information
Fecundity	The likelihood of further sensations of the same kind	-	Unable to assign
Purity	The likelihood of not being followed by opposite sensations	-	Unable to assign
Extent	How many people will be affected?	Prescribing antimicrobials effects the patient and those close to them, while the development of AMR is a certainty and may affect everyone, causing significant suffering and mortality	Immense negative utility