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# Antimicrobial-related medication safety incidents: a regional retrospective study in West of Scotland hospitals

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## SUMMARY

**Background:** Medication-related incidents are an important consideration in enhancing patient safety in hospital care. The wide use of antimicrobial therapy in this population renders these medications particularly vulnerable to errors and adverse events.

**Aim:** To analyse the characteristics of antimicrobial-related incident reports across a group of secondary care hospitals.

**Methods:** Reports for antimicrobial-related incidents from April 2010 to December 2013 were obtained from a regional area of hospitals in National Health Service Scotland. Reports were analysed as a full set, and with subset analyses of incidents resulting in patient harm/injury and those included in a multi-variable regression adjusted by occupied bed-days and defined daily doses to better ascertain areas to target for antimicrobial safety.

**Findings:** In total, 1345 incidents were reported at a crude rate of 0.98 reports/day [95% confidence interval (CI) 0.93–1.03 reports/day]. Penicillins (371 reports; 27.6%), aminoglycosides (358; 26.6%) and glycopeptides (210; 15.6%) were the most commonly involved classes of medications. Most incidents involved no injury/harm (514; 38.2%), but 72 reports (5.4%) did result in patient harm. The rehabilitation/assessment [relative rate (RR) 2.61, 95% CI 1.70–4.03] and women/childrens (RR 2.04, 95% CI 1.39–2.99) directorates had higher incident reporting rates compared with other directorates, likely as a function of at-risk patient populations. Among the types of incidents reported, those involving issues with administration/supply were most common (RR 2.07, 95% CI 1.51–2.84).

**Conclusion:** Incident reporting for antimicrobials identified several key areas for quality improvement in the hospital setting, which can guide safety efforts.

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## Introduction

Patient safety incident reporting is recognized as an important quality improvement measure and a focus for the delivery of health care. In 2005, it was estimated that patient safety incidents resulted in additional annual costs to the UK

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National Health Service (NHS) of £2 billion in extra hospital bed-days and £1 million in treating hospital-acquired infections; medication errors were found to be the second most commonly reported incident behind patient injury due to falls.<sup>1</sup> The number of medication incident reports in England/Wales increased from approximately 42,000 in 2005 to over 132,000 in 2010.<sup>2</sup>

Although reports indicate the presence of undesired incidents, increased reporting in itself can be considered a positive trend as it is known that the number of actual events greatly surpasses the number of reports made, and overcoming clinician barriers to making reports is a key step in improving medication use.<sup>3</sup> For instance, reporting rates in the acute care setting have been positively correlated with hospital staff perceptions of positive safety culture at their institution.<sup>4</sup> In England, two patient safety alerts were released regarding incident reporting for medications and medical devices, and the formation of national networks to enhance understanding and prevention of these events.<sup>5</sup> Similarly, Healthcare Improvement Scotland recently published a national framework for learning from adverse events, which recommends a continuum of event identification, reporting, review and improvement to enhance safety in patient care.<sup>6</sup>

Antimicrobial agents are some of the most widely prescribed medications in health care across the world.<sup>7</sup> Due to their extensive use across the clinical spectrum, their prescribing is particularly vulnerable to errors and adverse events. An analysis of over 21,000 adverse drug events in outpatients in the USA identified the top three responsible medications as insulin, warfarin and amoxicillin; antibiotics were responsible for seven of the top 18 implicated medications.<sup>8</sup> Two analyses of medication-related incidents in UK hospitals found that between 13.1% and 14.3% of incidents involved antimicrobials.<sup>9,10</sup> Events involving antibiotics can occur across all stages of the medication-use spectrum, and have potential for serious consequences, particularly with regard to prescribing without consideration of allergy status, or delayed or missed administration in the case of life-threatening infections.

Traditionally, the focus on antimicrobial utilization has been on limiting inappropriate use through stewardship to protect against the unnecessary development of resistance; however, this does not fully capture the whole spectrum of use. In-depth analysis of medication errors associated with antimicrobials, although limited, is an important contributor to the understanding of this class of high-risk and widely used medications. Therefore, the objective of this study was to analyse the characteristics of incident reporting relating to antimicrobial therapies across a regional group of secondary care hospitals in the West of Scotland.

## Methods

### Setting and data

This study was a retrospective analysis of Datix incident reports involving antimicrobials. Datix is a web-based software tool used for the collection, analysis and dissemination of information related to patient safety and risk management; approximately three-quarters of the NHS in the UK uses the software in this capacity.<sup>11</sup> The tool is available for a variety of uses, including reporting of incidents by clinicians (medication-

related or otherwise), patient experience/feedback, malpractice claims management and institutional self-assessment.<sup>11</sup>

The data extract from Datix was limited to medication-related incident reports submitted from a single regional health board in Scotland, serving a population of approximately 1.2 million people. Data were exported for a 15-quarter time period (April 2010 to December 2013) for participating institutions within the health board area. Reports were limited to include only those associated with systemic medications for infection listed in Chapter 5 of the British National Formulary (BNF), including subsections on antibacterial, antifungal, antiviral, antiprotozoal and anthelmintic medications.<sup>12</sup> Data columns of interest included hospital directorate (a coordinated group of related clinical specialties), medication administered, and incident date, subcategory, stage, description, action taken, result and severity. All characteristic variables were categorical in nature (Table I) with the exception of the medication administered and incident description/action taken, which included subjective text from the reporter. The incident result was consolidated from 19 categories in Datix to five user-defined categories to facilitate analysis. No ethical approval was deemed necessary to conduct this study.

### Overall analysis

Data were first evaluated as a function of total raw reports from the complete data extract, and were broadly described among available variables. Medications administered during the incident were grouped into corresponding BNF subsections with the exception of Subsection 5.1.7 ('Some other antibacterials') for which vancomycin and teicoplanin were analysed separately as 'glycopeptides'.<sup>12</sup> A further in-depth analysis regarding incidents resulting in patient harm was conducted using incident subcategories and narratives from the report

**Table I**  
Selected variables and categories in the Datix extract

Variable	Categories
Hospital directorate	Diagnostics
	Emergency/medical <sup>a</sup>
	Facilities/estates
	Health/community care
	Mental health
	Pharmacy services
	Regional services <sup>b</sup>
	Rehabilitation/assessment <sup>c</sup>
	Sexual health
	Specialist childrens
	Surgery/anaesthetics
	Women/childrens
	Incident stage
Preparation/dispensing	
Administration/supply	
Monitoring/follow-up	
Advice	
Supply/use of over-the-counter medicine	
Other	

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