Executive Summary:
A Point Prevalence Survey of Antimicrobial Use:
Benchmarking and Patterns of Use to Support Antimicrobial Stewardship Efforts

Investigational Team:
Diane Brideau-Laughlin BSc(Pharm), MSc (candidate); Gabriel Girouard MD, FRCPC; Mario Levesque BPharm; Timothy MacLaggan BSc(Pharm), ACPR; Josh Murray (BA MSc); Joanne Salmon MD, FRCPC, MPH

Background:

According to Accreditation Canada, the primary focus of an antimicrobial stewardship program is to "optimize the use of antimicrobials to achieve the best patient outcomes, reduce the risk of infections, reduce or stabilize levels of antibiotic resistance, and promote patient safety".[1] Furthermore they state that "organizations are encouraged to tailor their antimicrobial stewardship approach consistent with their size, service environment, and patient population and to establish processes for ongoing monitoring and improvement of the program over time".[1]

Creating an antimicrobial stewardship program requires the acquisition of baseline information, including institutional antimicrobial use.[2] This helps identify recurrent problems with antimicrobial use at the institution and frames the problems that need to be addressed.[2,3]

Point prevalence studies have been found to be useful in providing information about antimicrobial usage patterns and assessing the impact of interventions to change antimicrobial prescribing.[4,5] Such surveys have been documented for over 30 years and can help stewardship teams focus on clinical scenarios where opportunities to optimize therapy exist, where overuse is common and where antimicrobial therapy can be stopped when appropriate.[5,6]

Prior to this study, no data were available to accurately assess antimicrobial utilization within hospitals in New Brunswick. Without these data, the Provincial Anti-Infective Stewardship Committee has no baseline against which to develop targeted antimicrobial stewardship interventions and measure the effectiveness of such interventions.

Accordingly, a point prevalence study with a primary objective to determine antimicrobial usage patterns within all New Brunswick hospitals and a secondary objective to determine the

proportion of antimicrobial orders that were appropriate based on pre-defined criteria was completed.

Methods:

The survey was completed in the majority of New Brunswick Hospitals (n=21, 95.5%) where in-patient acute, general medical, surgical or pediatric services are provided. All patients admitted to a participating hospital administrative unit at the time of the survey were included in the study. Patients who were receiving systemic antimicrobials at the time of the survey were identified, and the details of their therapeutic or prophylactic antimicrobial therapy were recorded. For surgical patients, details regarding prophylactic antimicrobials received in the previous 24 hours were recorded. This allowed coding of the duration of prophylaxis as either: 1 dose, ≤ 24 hours or > 24 hours. Main outcome measures included patterns of utilization based on indication and antimicrobial prescribed appropriateness of utilization, and duration of surgical prophylaxis. Appropriateness was assessed independently by a clinical pharmacist and infectious disease specialist and any discrepancies were discussed and conclusions reached by consensus. Descriptive statistics and Chi-Squared test of independence were used to analyze the data

Results:

The survey was completed between June and August 2012. A total of 2244 patients were admitted at the time of the survey; 529 (23.6%) were on antimicrobials. A total of 691 antimicrobials were prescribed, 326 (47%) were for community-acquired infections, 261 (38%) were for hospital-acquired infections, 82 (12%) for surgical prophylaxis and 22 (3%) for medical prophylaxis. Within the treatment group (n=587) the most frequently prescribed classes of antimicrobials were quinolones (n=150, 25.6%), extended-spectrum penicillins (n=60, 10.2%), metronidazole (n=50, 8.5%), third-generation cephalosporins (n=49, 8.3%) and aminopenicillins (n=46, 7.8%). Ciprofloxacin was commonly prescribed for multiple indications. The most common indications for treatment were pneumonia (n=140, 30%), gastrointestinal infections (n=74, 16%), skin and soft tissue infections (n=68, 14%), and cystitis (n=55, 12%). Based on predefined criteria 43% (n=254) of orders were incomplete or inappropriate. Twenty percent (n=120) of orders had no documented indication. Areas of inappropriateness included not switched from IV-to-PO (n=34, 6%), inappropriate dose (n=30, 5%), treatment of asymptomatic bacteriuria (n=24, 4%) and inappropriate duplication of therapy (n=22, 4%). Thirty-three percent of surgical prophylaxis orders exceeded 24 hours. The remaining 57% of orders did not meet any predefined inappropriateness criteria. The most common prescriber types were Family Medicine (34%), Surgery (25%) & Internal Medicine (14%). Hospitals with ID services had a significantly lower rate of inappropriate or incomplete antimicrobial orders, 35% vs. 51.2% ($p<0.0001$).

Discussion:

The study showed that quinolones were the most frequently prescribed class of antimicrobials in NB hospitals, representing nearly 26% of treatment orders. This is worrisome as increased use of quinolones has been associated with increased rates of antimicrobial resistance both within the class and between classes of antimicrobials.[7] In addition, the study supports that efforts should be focused on enabling IV-to-PO step-down, de-escalation, appropriate antimicrobial dosing, and halting the treatment of asymptomatic bacteriuria and unnecessary duplicate therapies. These common antimicrobial use issues may be intervened on through a variety of strategies requiring various levels of resources such as antibiotic policies, audit and feedback, clinical guidelines and delegated functions.

A total of 20% of antimicrobial therapy orders were incomplete as no documented indication was present which limited any further assessment of appropriateness. While an important finding in itself, from a quality assurance and practice standards perspective, it may also represent an important gap in the study data. The 57% of antimicrobial orders that did not meet any predefined inappropriateness criteria were not necessarily reflective of appropriate antimicrobial use. A broader choice of predefined inappropriateness criteria may have identified a larger proportion of orders as inappropriate or incomplete.

Limitations:

A point prevalence study only captures data from a moment in time and may not be reflective of the overall antimicrobial prescribing trends within NB's health networks.[8] No definitive statement can be made based on the results of the study but they may be indicative of where further efforts should be focussed.[8] Follow-up studies will be required to investigate and evaluate the contribution of potential factors that may lead to deviations from optimal prescribing. Another potential limitation lies with the application of the inappropriateness criteria. No inter-rater reliability test was performed.

Conclusion:

The findings support our suggestion that antimicrobial stewardship efforts should focus on improving adherence to documentation standards, optimising the use of quinolones, enabling IV-to-PO step-down, appropriateness of dosing, halting treatment of asymptomatic bacteriuria and minimizing the length of surgical prophylaxis. Further research is required to better define the antimicrobial drug use issues identified.

Table 1: Patient Demographics

Number of Patients	**529**
Average Age	**67.1(SD 18.8)**
Gender	**46.3% male**
Admitted to ICU	**9.1%**
Documented ID Consult	**11.9%**
Immunosuppression	**14.9%**
Number of Antimicrobials per Patient **1** **2** **≥3**	 **73.7%** **22.5%** **3.8%**

Figure 1: Proportion of Patients on Antimicrobials by Region and Zone

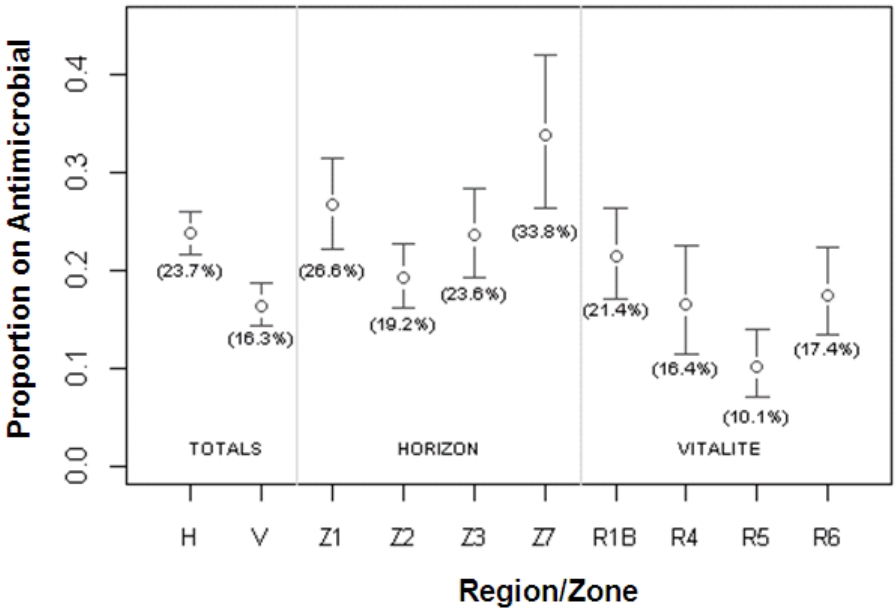

Figure 2: Number of Antimicrobials by Indication

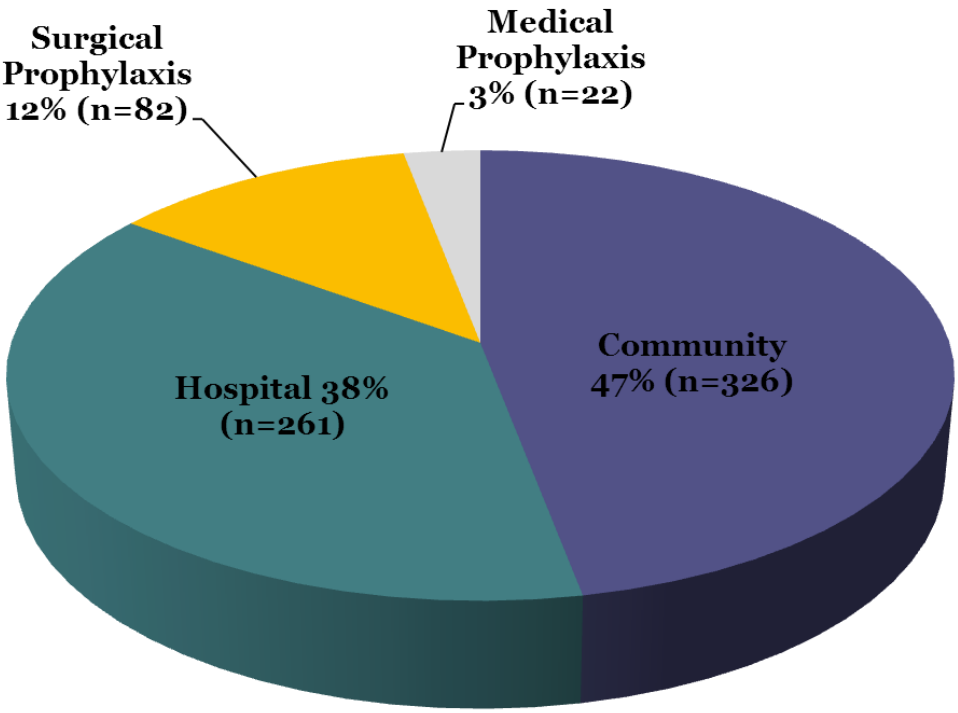

Figure 3: Antimicrobial Usage by Class

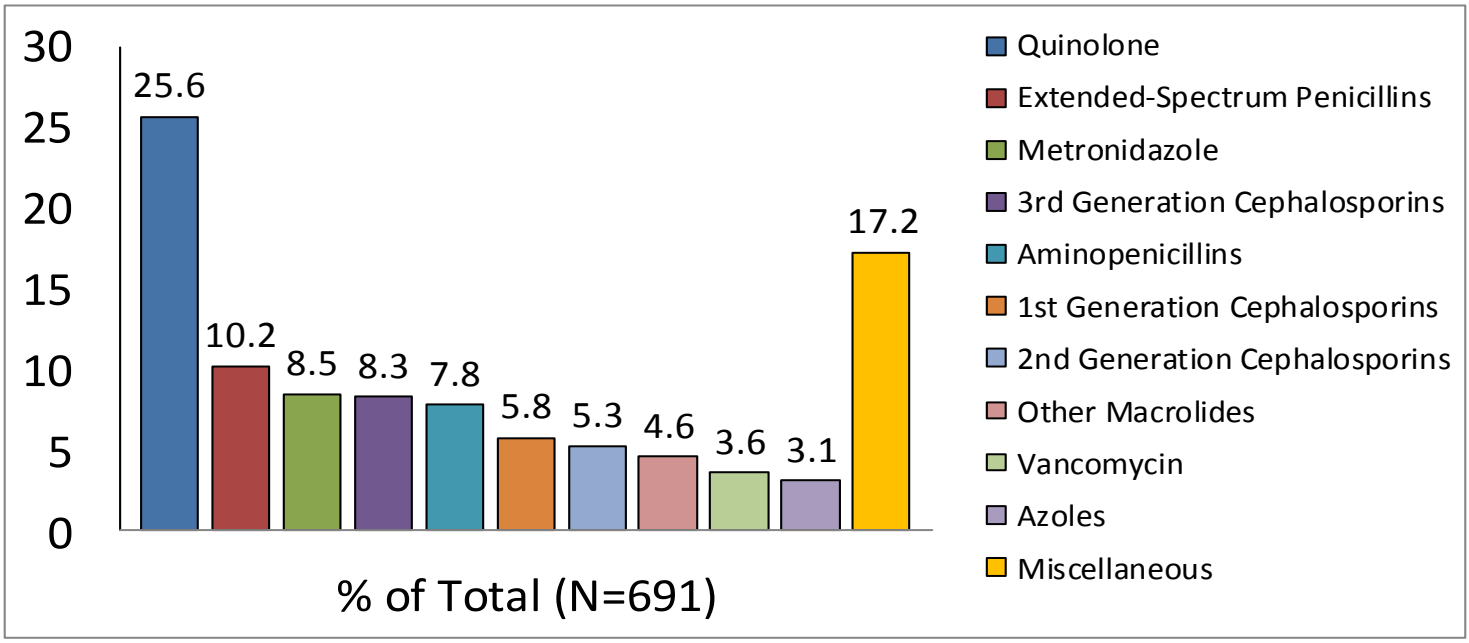

Figure 4: Ciprofloxacin Usage by Anatomical Site

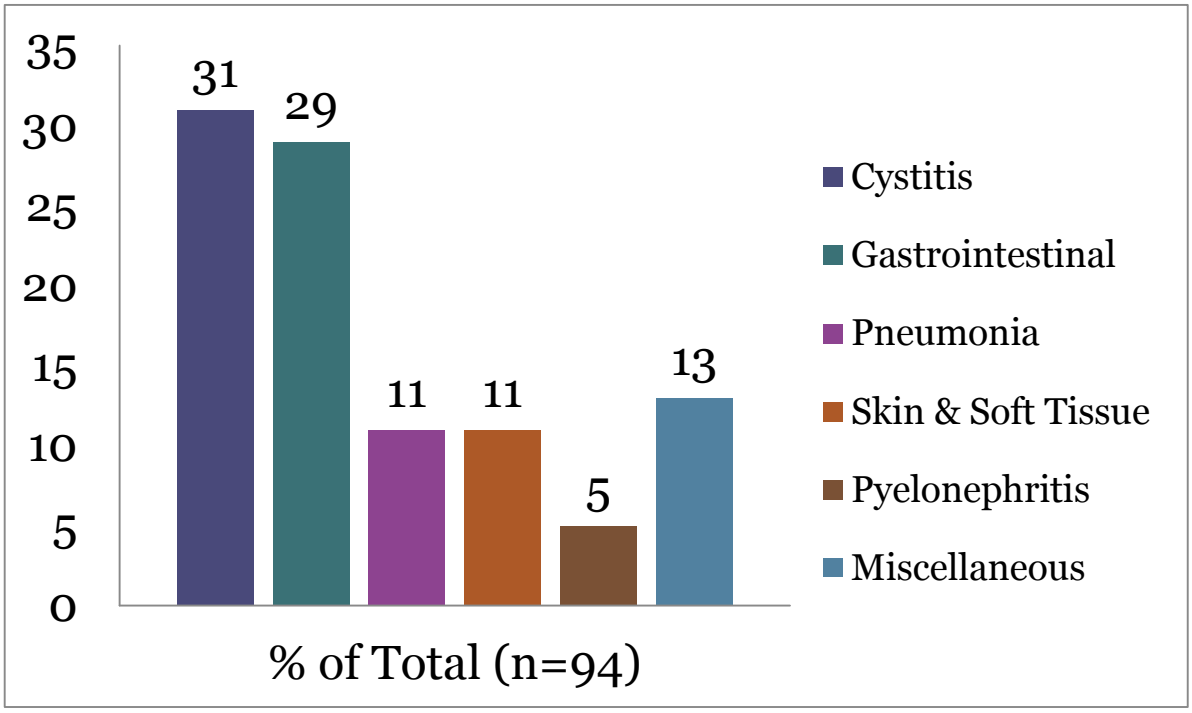

Figure 5: Most Common Anatomical Sites for Community and Hospital Acquired Infections

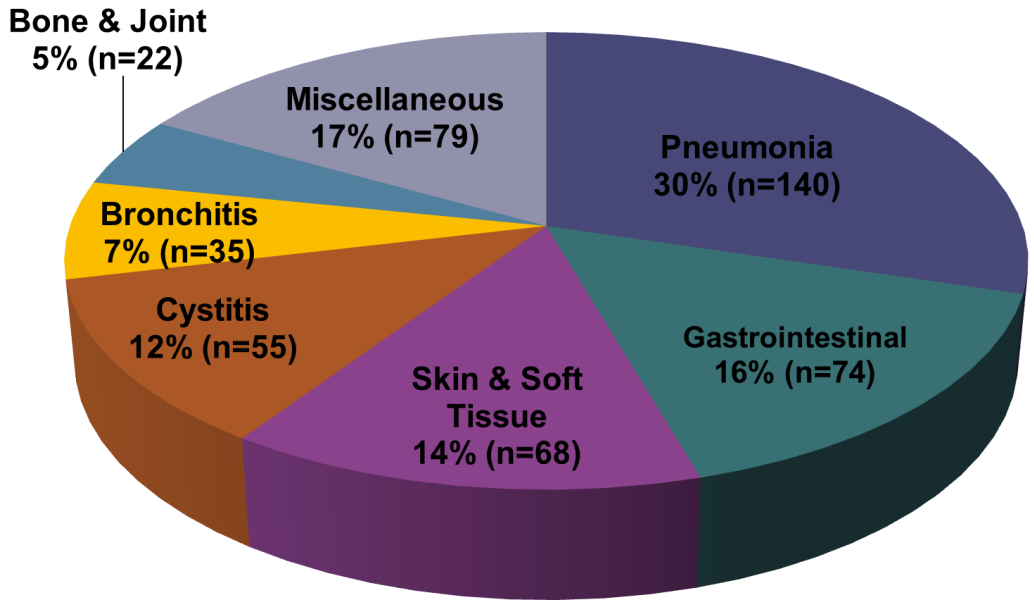

Figure 6: Appropriateness of Antimicrobial Prescribing

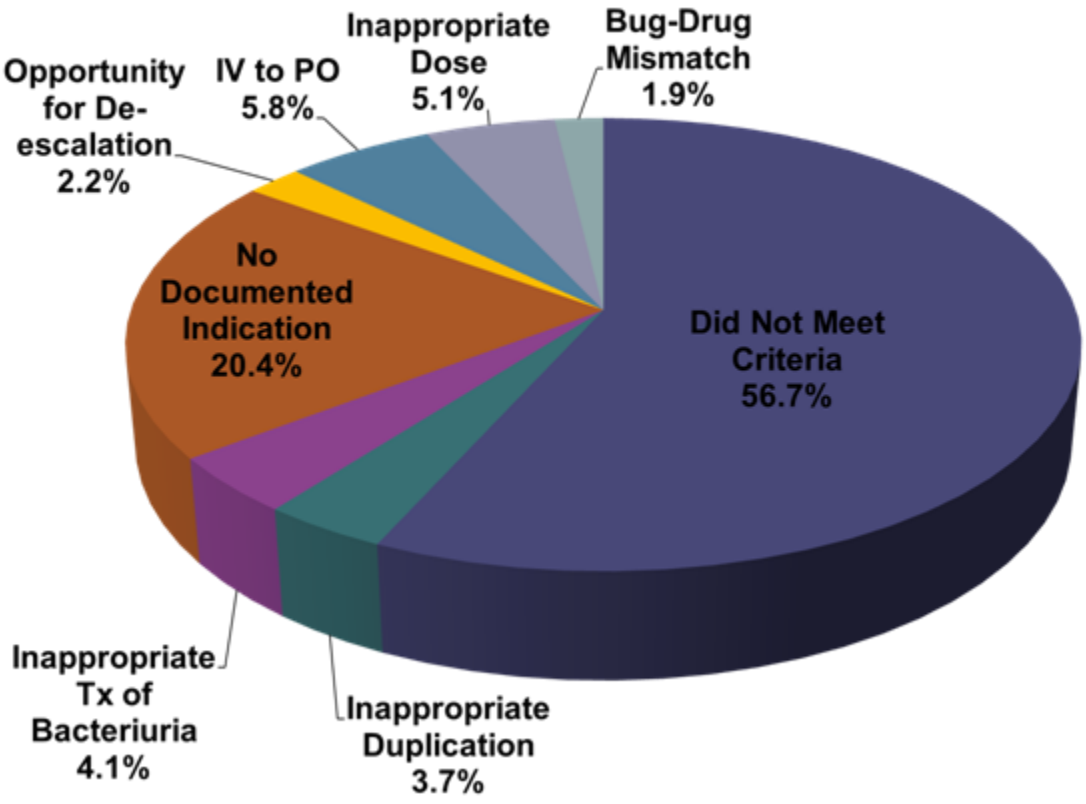

Figure 7: Duration of Surgical Prophylaxis

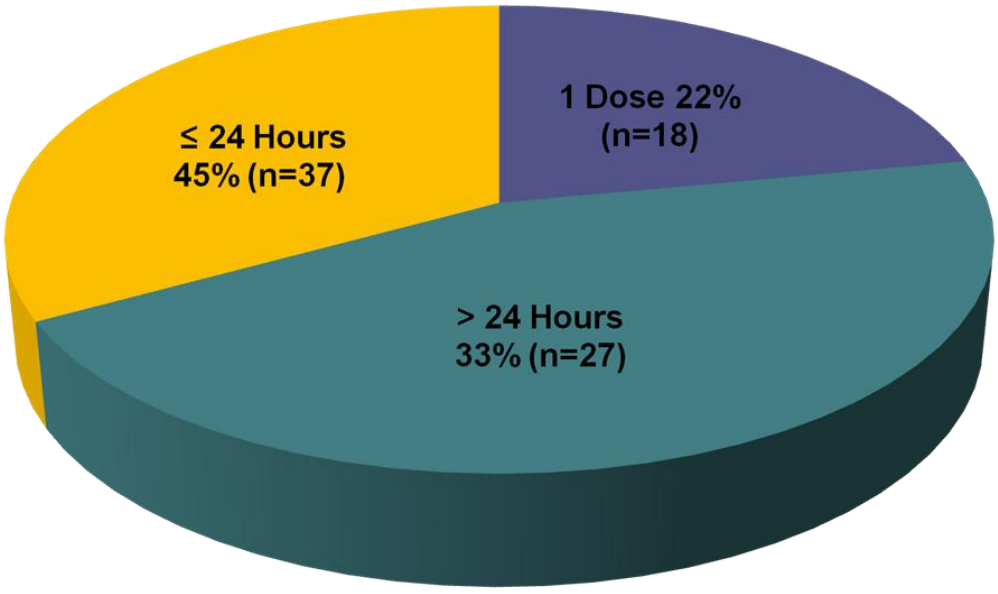

Table 2: Prescriber Type

	N=691	%
Family Medicine	238	34
Surgeon	173	25
Internal Medicine	99	14
Hospitalist	56	8
Infectious Disease/Microbiologist	49	7
Emergency Room Physician	45	7
Intensivist	23	3
Geriatrician	7	1

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