Needs Assessment for Antimicrobial Stewardship in a Rehabilitation Hospital: A Retrospective Descriptive Study

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ABSTRACT

Background: Published antimicrobial stewardship (AS) initiatives have focused on acute care hospitals. AS may be important in rehabilitation hospitals to reduce unnecessary antibiotic use in patients at risk for urinary tract infection (e.g. stroke, burn, trauma, orthopedic surgery) and prolong hospital stay.

Objectives: To benchmark antibiotic use and identify potential targets for future AS interventions at a rehabilitation hospital.

Methods: A computerized database retrospective study was conducted at St. John’s Rehab Hospital (SJRH), affiliated with Sunnybrook Health Sciences Centre, Toronto, Ontario. Antibiotic use and microbiology data for all hospitalised patients between July 1, 2015 and June 30, 2016 were collected. The primary benchmark metric was days of antibiotic therapy per 100 patient days, frequency of prolonged antibiotic therapy, identification of most common antibiotic prescribed, and number of cultures sent by process of microbiology.

Results: During the study period, 800 antibiotic courses were prescribed in 705/2483 patients (28%; 95% CI: 27.6% - 28.8%) and 1,000 hospital admissions, the number of hospital discharges, and the overall average patient length of stay during the study period were obtained from Decision Support at the facility. A total of 398 patients received a course of antibiotics, of whom 95% (n = 377) were admitted to SJRH from SJRH. Inpatient and Outpatient charts were reviewed to determine if antibiotics were discontinued before discharge or at the end of the study period.

Statistical Analysis: Descriptive analyses were completed using Microsoft Excel 2010 software (Microsoft Corporation, Redmond, Washington) and GraphPad Instat (version 3.05, 32 for Win 98/NT, created September 27, 2000).

Conclusions: Rehabilitation hospitals may benefit from AS initiatives that evaluate appropriate antibiotic duration, de-escalation opportunities, evaluation of all patients prescribed fluoroquinolones, cephalosporins, and penicillins, assessment of urine samples ordered, drawn and processed, and improved empiric prescribing based on a site-specific antimicrobial stewardship plan.

METHODS

Patient Eligibility: All inpatients who resided in the rehabilitation hospital between July 1, 2015 and June 30, 2016, and who were prescribed antibiotics and/or had microbiology results were included.

Data Collection: Data relevant to antibiotic use were obtained from the Pharmacy database of the facility.

Results: Data to microbiology workload were obtained from the Microbiology database of the facility.

• The number of patient days per month, the number of hospital admissions, the number of hospital discharges, and the overall average patient length of stay during the study period were obtained from Decision Support at the facility.

• Patient days per month is defined to standardize antibiotic use and microbiology workload to 100 patient days, to allow benchmarking within and between institutions.

Statistical Analysis:

Descriptive analyses were completed using Microsoft Excel 2010 software (Microsoft Corporation, Redmond, Washington) and GraphPad Instat (version 3.05, 32 for Win 98/NT, created September 27, 2000).

• Interval data are reported as means with standard deviation or median with interquartile range (IQR), based on either or not data passed the test for normally (GraphPad Instat).

• Nominal data are reported as a percentage with a 95% confidence interval (CI).

• The primary benchmark metrics for antibiotics were days of antibiotic therapy (DOT)/100 patient days (PD), frequency of prolonged antibiotic therapy > 7 days and > 10 days, and identification of most common antibiotic prescribed during the study period.

• The secondary antibiotic outcomes for antibiotics were DOT/1000 PD categorized by antibiotic class, intravenous antibiotics, oral antibiotics, and days of IV antibiotic therapy saved by transitioning to oral.

• The primary benchmark metrics for microbiology was an assessment of workload for processing cultures drawn for inpatients expressed as the number of samples processed by the microbiology laboratory/100 PD.

• An institution-specific antimicrobial stewardship plan was developed for the most frequently isolated bacteria during the study period.

OBJECTIVE

The objective of this study was to assess the use of antibiotics in a rehabilitation hospital to benchmark antibiotic use and identify potential targets for future AS interventions.

METHODS

Study Design and Setting:

• Retrospective descriptive study of antibiotic use among inpatients at a 365-bed rehabilitation facility was performed at St. John’s Rehab (SJRH) in Toronto, Ontario.

• SJRH provides customized rehabilitation for patients recovering from various injuries, such as amputations, traumatic injuries, cardiovascular surgery, strokes, cancer, complex neurological and orthopedic conditions.

• SJRH is home to Canada’s only organ transplant rehabilitation program and Ontario’s only burn rehabilitation program.

• The study period was July 1, 2015-June 30, 2016.

• Institutional Ethics Review Board approval was obtained from the University of Toronto, Faculty of Medicine.

RESULTS

Demographic Characteristics:

• 2,483 patients were admitted to the hospital, and 2,483 were discharged from the hospital during the study period.

• 705 (28%; 95% CI: 27.6% - 28.8%) patients received a course of antibiotics.

• 240 (33.1% of 705) patients were admitted to SJRH on antibiotics.

• Median age of patients on antibiotics was 77 (IQR 66 – 84).

• 424 (60%) patients who received a course of antibiotics were female.

• Total number of patient days at the site during study period was 52,551 days, with an average overall patient length of stay for all patients admitted during the study period.

• The median length of stay for patients who received a course of antibiotics during the study period was 22 days (IQR 14 – 33).

Table 2. Microbiology Workload

Characteristic | Number | Percent | 95% Confidence Interval
--- | --- | --- | ---
Source | | | |
Urine | 467 | 62 | (58 – 67)
Blood | 1 | 0.2 | (0 – 1)
Swab / Wound | 167 | 17 | (13 – 22)
Specimen in Urine | 168 | 60 | (54 – 66)
E. coli total | 150 | 54 | (48 – 60)
E. coli NSBL | 109 | 37 | (31 – 44)
E. coli RESL | 12 | 2 | (0 – 4)
N. gonorrhoeae | 1 | 1 | (0 – 2)
K. pneumoniae | 40 | 14 | (10 – 18)
Species in Swab or Wound | 37 | 14 | (9 – 20)
MRSA | 19 | 11 | (7 – 16)
S. aureus | 39 | 15 | (9 – 22)
EBSL extended spectrum β-lactamase | 26 | 46 | (38 – 55)
MSSA methicillin sensitive 3 | 10 | (6 – 18)
MRS A methicillin resistant 5 | 7 | (4 – 10)

CONCLUSION

• This retrospective descriptive study assessed antibiotic use in a rehabilitation hospital.

• To the best of our knowledge, this is the first study to provide metrics for antibiotic use in a rehabilitation hospital, and serves to benchmark antibiotic use and identify potential targets for future antimicrobial stewardship initiatives to improve care efficiency for this patient population.

• Approximately 28% of patients admitted to SJRH were treated with at least one antibiotic during their stay.

• Oral antibiotics were most commonly prescribed (91%) and therefore, may be important targets for future AS initiatives.

• The most commonly used antibiotics were fluoroquinolones (27%), cephalosporins (26%), penicillins (17%), and vancomycin (15%).

• Although no antibiotic course was continued for > 90 days, 41% of courses were continued for > 7 days, suggesting that education and implementation of appropriate duration of antibiotic therapy may be an important antimicrobial stewardship initiative.

• The number of patients in our study that > 90% of the days were not on antibiotics was 50%.

• However, 94% of IV courses were active on admission to SJRH and therefore, opportunities for modification based on appropriateness may be limited.

• The incidence of UTI was 369/1000 patient days and the median duration of treatment was 28 days (IQR 22 – 33 days).

• The rate of DOT/1000 patient days for antibiotics corresponds to about 24% of the use seen in our acute care facility (Sunnybrook Health Sciences Centre – Bangalore Campus), and therefore, may justify an additional equivalent position for an antimicrobial stewardship pharmacist.

• Urine was the most frequent source processed by microbiology (26%), and E. coli was the most common bacterial isolate tested (60%, 1% EBSL and 1% MSSA).

• The prevalence of MRSA at the facility was 1%.

• Baseline data were collected and future targets for potential future antimicrobial stewardship interventions identified include implementing a prospective audit and feedback initiative of the most frequently used antibiotic classes (fluoroquinolones, cephalosporins, penicillins, and rifampin); assessing duration of therapy to minimize unnecessary antibiotic exposure; reassessing duration of therapy to the potential for improved transition to oral stepdown antibiotic therapy; and the exploration of initiatives to potentially reduce the number of urine samples for culture and susceptibility ordered, drawn and processed by microbiology.

• Patients that should be explored related to an AS program include: patients with diabetes mellitus, patients with chronic health care professionals about urinary tract infections versus asymptomatic bacteriuria, implementing microbiology policies that reduce outpatient laboratory testing and self‐payment, and prospective audit programs to evaluate patients for whom a urine culture has been ordered with utilization of an updated．

• Areas of antibiotic use at this rehabilitation hospital which may benefit from antimicrobial stewardship include potential possibilities to reduce antibiotic use and appropriate duration.

• Although we did not assess appropriateness in this study, there may be opportunities to reduce duration of therapy, promote patient’s oral step down therapy, and improve prescribing based on site-specific antimicrobial stewardship.