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A Healthcare Worker and Patient-Informed Approach to Oral Antibiotic-Decision Making During the Hospital-to-Home Transition

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Abstract

In a qualitative study of healthcare workers and patients discharged on oral antibiotics, we identified five barriers to antibiotic-decision making at hospital discharge: clinician perceptions of patient expectations, diagnostic uncertainty, attending-led vs. multi-disciplinary team culture, not accounting for total antibiotic duration, and need for discharge prior to complete data.

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Conflicts

The authors report no conflicts of interest.

Keywords

Antibiotic stewardship; care transitions; antibiotic decision-making; healthcare delivery

Introduction

Antibiotic prescribing at discharge is an important and under-recognized opportunity to improve antibiotic use.[1–3] Most antibiotic courses initiated in hospitals are completed post-discharge.[1–3] While over half of discharge antibiotic prescriptions are of excessive duration,[1,2,4] overly-broad,[3] or unnecessary,[4] there is limited knowledge about the drivers of discharge antibiotic decision-making. Further, unlike in hospitals, patients are responsible for acquiring, taking, and completing the antibiotic at home. We performed a qualitative evaluation of healthcare workers (HCWs) and patients discharged on antibiotics to understand the intertwined work systems of discharge antibiotic decision-making and antibiotic medication management (MM)[5] to identify barriers to and strategies for discharge AS.

Methods

We used two approaches to evaluate AS at the hospital-to-home transition: (1) in-person semi-structured interviews with HCWs; and (2) contextual inquiry followed by semi-structured interviews of discharged patients. HCWs and patients were recruited from a tertiary care hospital in Baltimore, MD and a community hospital in Bethesda, MD.

We performed purposive sampling in semi-structured interviews to capture experiences from different HCW roles.[6] Eligible HCWs were ≥18 years, able to speak and read English, and either inpatient HCWs or providers from an ambulatory clinic. The interview guide was based on the Four Moments in Antibiotic Decision-Making framework adapted to hospital discharge[7] and the Transition Model of MM (Appendix A).[5] Two investigators (SCK and SLS) conducted interviews January 2019-August 2019.

Contextual inquiry involves observing individuals--here, patients--in their work system (antibiotic MM), and asking clarification questions.[8] Eligible patients were ≥18, English-speaking, and not on hospice. Contextual inquiry guides were based on the Transition Model of MM and the Systems Engineering Initiative for Patient Safety (SEIPS) 2.0 model.[9] One or two investigators (SCK, SLS) visited patients' homes for contextual inquiries July 2019-February 2020.

Interviews were audio-recorded and transcribed. Two investigators (SCK, SLS) created a preliminary code structure[6] after independently reviewing and comparing three transcripts. A third investigator (AIA) independently reviewed eight transcripts, while two investigators (SCK, SLS) reviewed each transcript. The code structure was revised as subsequent transcripts were reviewed, with changes applied retroactively.

Directed content analysis of the transcripts was performed, focusing on barriers to and strategies for discharge antibiotic decision-making. While the overall analysis was deductive

and based on the models,[5,7,9] we used inductive reasoning as additional themes emerged. Themes presented included recurrent unifying concepts or statements, particularly those that were frequent, novel, or relevant.[6] Interviews were conducted until thematic saturation was reached (that is, no new themes or understandings were obtained).[6] Analysis was facilitated with NVivo 12 Pro (QSR International, Australia). The Johns Hopkins University IRB approved this study.

Results

Thirty-seven HCW interviews and 16 patient contextual inquiries were performed (Table 1). Barriers to and strategies for discharge antibiotic decision-making (as discussed by participants, or observed during contextual inquiry) are described (Table 2). Five underlined themes highlight barriers to and strategies for discharge antibiotic decision-making.

HCW perceptions of patients' expectations for antibiotics sometimes impacted antibiotic prescribing, as one community-hospital hospitalist explained: "Patients love getting antibiotics… Sometimes families and patients demand antibiotics; they think they need them." However, other HCWs noted decreasing patient requests for antibiotics, and patients did not describe wanting antibiotics.

Diagnostic uncertainty impacted inappropriate prescribing. Due to an elevated procalcitonin, a 68-year-old male patient with rhabdomyolysis was discharged with a diagnosis of "bronchitis" and six days of amoxicillin-clavulanate: "I [saw] on the discharge papers that they diagnosed [me with] bronchitis … it seems that the significant manifestation of whatever I had was the pains in my legs…"

Team culture and communication influenced discharge antibiotic-decision making. On some medical teams, clinicians, pharmacists, discharge coordinators, and social workers together reevaluated antibiotic prescribing and identified affordable medications. On some surgical teams, antibiotic choices were described as being attending-led. Multidisciplinary versus hierarchical attending-led team cultures impacted discharge antibiotic prescribing.

Poor communication across clinicians and care settings impacted decisions about duration. Accounting for total duration was highlighted as a major barrier, as described by an academic pharmacist: "It's easier to write a script for 10 days versus looking back to count up everything."

Determination of total antibiotic duration usually excluded pre-admission duration due to limited information on pre-admission events, resulting in prolonged antibiotic courses. In one contextual inquiry, a patient presenting for a lumbar fusion was given 7 days of nitrofurantoin for asymptomatic bacteriuria. After 3 pre-admission, 6 inpatient, and 7 post-discharge days of therapy, and with instructions to complete all her antibiotics which she interpreted to include those at home, she took 20 days of nitrofurantoin for asymptomatic bacteriuria. Participants described mitigation strategies including setting a fixed end date and calculating in-hospital days of therapy. Not accounting for treatment across the course of illness may result in excessive antibiotic duration.

Organizational emphasis on early discharge prior to return of clinical and microbiologic data impacted antibiotic decision-making. Proactive discussions about antibiotic choice and duration mitigated this barrier.

Discussion

Our study identified five main barriers to AS at hospital discharge: 1) clinician perception of patient expectations, 2) diagnostic uncertainty, 3) multidisciplinary versus hierarchical attending-led cultures, 4) not accounting for the total antibiotic duration, and 5) organizational pressure for discharge.

Clinician perceptions of patient demand for antibiotics has been described as promoting inappropriate antibiotic use in ambulatory settings.[10] Interview participants differed in whether these perceptions drove antibiotic prescribing. Proposed mitigation strategies include patient education and clinician communication training.

Diagnostic uncertainty was identified as a driver of inappropriate antibiotic prescribing. Treatment guidelines may mitigate diagnostic uncertainty.

Team culture contributed to discharge antibiotic decision-making. AS efforts for discharge antibiotic decision-making should consider team culture by targeting interventions to the decision makers.

Another common challenge was not accounting for in-hospital and pre-admission antibiotics. Our study identifies a need to implement structured strategies to account for the total antibiotic duration across the course of illness, through improved medication reconciliation at admission and discharge. Patients who are told to finish “all of their antibiotics” may interpret this as finishing antibiotics from a pre-admission prescription; clinicians should clarify these instructions. Antibiotic time-outs at the time of discharge can readdress antibiotic choice and duration.

Discharge on empiric antibiotic therapy with incomplete data was identified as a barrier to antibiotic decision-making, contributing to prolonged treatment and lack of antibiotic de-escalation.

The strengths of this study include the integration of inpatient and outpatient HCW and patient perspectives in understanding barriers to discharge antibiotic decision-making at hospital discharge. There are several limitations. Although thematic saturation was observed, perspectives may have been missed, particularly male HCWs and attendings. Only participants who spoke English were included, limiting generalizability to non-English speaking populations. As our study focused on oral antibiotics, we did not focus on the distinct process of discharge on OPAT. As this is a qualitative study, it is hypothesis-generating with a focus on transferability rather than generalizability. Further work is required to test the impact of proposed interventions.

Improving antibiotic prescribing practices at hospital discharge is a complex task with multiple barriers. AS programs should target hierarchical structures, differences in service

cultures, and diagnostic uncertainty. The antibiotic decision-making work system needs to account for the total duration of antibiotics to avoid prolonged courses of therapy. Discharge on empiric therapy before clinical and microbiological data can be mitigated by proactive antibiotic planning. Implementation of targeted interventions can result in more effective outcomes for antibiotic use at the hospital-to-home transition.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Characteristics of Healthcare Workers and Patients Discharged on Oral Antibiotics who Participated in Studies

Characteristic	HCW Interviews (% of 37)	Patient Contextual Inquiry (% of N=16)
Hospital of Employment or Discharge		
Johns Hopkins Hospital	27 (73%)	11 (69%)
Suburban Hospital	10 (27%)	5 (31%)
Gender		
Female	30 (81%)	9 (56%)
Male	7 (19%)	7 (44%)
Median Age (Range)	31 (25–67)	59 (20–85)
Median Length of Hospital Stay, Days (Range)	Not Applicable	4.5 (3–18)
Race		
White	Not Recorded	7 (44%)
African American	Not Recorded	9 (56%)
Position		
Housestaff	10 (27%)	Not Applicable
Hospitalists	3 (8%)	Not Applicable
Nurses	8 (22%)	Not Applicable
Pharmacists	6 (16%)	Not Applicable
Nurse Practitioners or Physician Assistants	9 (24%)	Not Applicable
Discharge Coordinators	1 (3%)	Not Applicable
Surgical Service	15 (41%)	Not Applicable
Medical Service	22 (59%)	Not Applicable
Years of Experience in Healthcare		
1–3 Years	21 (57%)	Not Applicable
4–7 Years	5 (14%)	Not Applicable
8–12 Years	5 (14%)	Not Applicable
More than 12 Years	6 (16%)	Not Applicable
Antibiotics Prescribed		
Beta-Lactam Antibiotic	Not Applicable	8 (50%)
Fluoroquinolone	Not Applicable	4 (25%)
Doxycycline	Not Applicable	2 (13%)
Nitrofurantoin	Not Applicable	1 (6%)
Trimethoprim-sulfamethoxazole	Not Applicable	1 (6%)
Metronidazole	Not Applicable	1 (6%)
Oral Vancomycin	Not Applicable	1 (6%)
More than One Antibiotic	Not Applicable	2 (13%)
Median Duration of Therapy (Range)	Not Applicable	6.5 (3–25)
Antibiotic Indication		
Community-acquired Pneumonia	Not Applicable	4 (25%)

Characteristic	HCW Interviews (% of 37)	Patient Contextual Inquiry (% of N=16)
Community-acquired Skin Infection	Not Applicable	4 (25%)
Community-acquired UTI or ASB	Not Applicable	4 (25%)
Community-acquired Bronchitis or COPD Exacerbation	Not Applicable	2 (13%)
Community-acquired Intra-abdominal Infection	Not Applicable	1 (6%)
Hospital-acquired *Clostridioides difficile* Infection	Not Applicable	1 (6%)

Abbreviations: HCW: Healthcare worker; UTI: urinary tract infection; ASB: asymptomatic bacteriuria; COPD: chronic obstructive pulmonary disease

Table 2.

Processes and tasks in the antibiotic-decision making work-system including barriers and strategies to address barriers

Process	Task	Barrier to Task	Strategies to Address Barrier
Antibiotic Choice	Deciding to prescribe antibiotic	• Distinguishing infectious from noninfectious conditions • Uncertainty around diagnosis or severity • Perception of patient desire for antibiotics • Comorbidities and socioeconomic status impact antibiotic choice and duration • Attending-led decision	• Culture data, labs, imaging • Understanding of common pathogens and likelihood of resistant organisms • Start antibiotics and reassess • Symptomatic management • Electronic heath record system with clinical decision support • Institutional and national guidelines • Personal interactions with antimicrobial stewardship programs and consulting services
	First choice of antibiotic	• Attending-led decision • Attending preference for antibiotic • Outdated guidelines • More comfortable with broad spectrum	• Multidisciplinary rounding • Pick narrowest option • Start broad spectrum then narrow • Strong pressure to deescalate antibiotic from pharmacist or antibiotic stewardship team
	Interaction with food or drugs	• Polypharmacy	• Enhanced patient education • Pre-discharge medication reconciliation
	Cost	• Unsure about insurance coverage, co-pay, or cost	• Test scripts, voucher • Multidisciplinary teams including social workers or case managers provide information to clinicians about cost
	Likelihood of adverse effects	• Allergies/toxicity • Discharged prior to trialing the antibiotic	• Educate patient around side effects • Change antibiotic to agent with less side effects • In-hospital trial of antibiotics
	Parenteral to oral conversions	• No suitable oral option • Attending preference for antibiotics • No antibiotic approval restrictions for outpatients	• Guidelines on oral step-down therapy • Trial of oral antibiotic in-hospital • Communication among team members
	Choosing antibiotic available to patient	• Lack of availability • Time-consuming process • Poor communication with pharmacy	• Use in-hospital pharmacy • Choose pharmacy based on patient preference • Send patient home with antibiotic
	Frequency of dosing	• Frequently-dosed antibiotics are difficult to adhere to	• Pick antibiotic with less frequent dosing

Process	Task	Barrier to Task	Strategies to Address Barrier
Antibiotic Duration	Accounting for in-hospital duration	• Calculating in-hospital duration • Difficulty tracking dates	• Set clear start date
	Accounting for pre-admission duration	• Lack of knowledge of pre-admission course • Lack of knowledge of antibiotic doses that patients may still have available	• Count in-hospital days of therapy • Medication reconciliation for antibiotics, including doses at home, at admission and discharge • Communication with ambulatory clinicians and outside hospitals
	Decision around total length of therapy	• Lack of availability of debridement may prolong duration • Use of drains leads to uncertainty of presence of source control • Attending-led decision • Service or attending preference for antibiotics	• Emphasize debridement • Educate around the role of drains in source control • Multidisciplinary rounding
	Duration prolonged at discharge	• Prescriptions sent prior to day of discharge may contain more days of therapy than required	• Prescribe a specific number of pills • Send prescription on day of discharge • Delay discharge to complete antibiotic course
Monitoring Plan	Patients know who to contact after discharge	• No clear contact arranged • Role ambiguity with follow up • Patient does not know who to call if problems from antibiotics or infection arise	• Transition guide • Call after discharge • Home health involvement • Involvement of primary care providers
	Patients have ability to self-monitor at home	• Patient lacks understanding of infection • Social support (may impact antibiotic choice • Lower health literacy may lead to longer durations • Patient lack of familiarity with managing other medications	• Adjust antibiotic choice and duration based on perceived social support and understanding of infection
	Ambulatory clinicians understand hospital course and plan.	• Poor communication between inpatient team and primary care providers. • Primary care providers unclear around updated guidelines	• Provide patient with data