Alberta Health Services

Drug Stewardship Program

"Effectiveness, Safety, and Sustainability"

Assessment of Current Antimicrobial Stewardship Policies and Resources

Focus Group Project Report

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Abstract

Background

Antimicrobial stewardship (AS) processes have not been evaluated within Pharmacy Services, Alberta Health Services (AHS). A focus group approach was used to qualitatively assess frontline pharmacy staff and leadership perspectives on AS resources.

Methods

A semi-structured interview process was lead by AHS drug stewardship pharmacists. Focus groups included Pharmacy Services employees from AHS and Covenant Health. Transcripts were reviewed by investigators, and consensus was reached on themes and topics that were identified. Codes were recorded for prevalence and total number of mentions.

Results

Ten percent of Pharmacy Services staff participated in the focus groups. Eight main themes were identified: antimicrobial resources, influences on antimicrobial utilization, barriers to antimicrobial stewardship, establishing AS teams, education needs, improving communications, antimicrobial utilization concerns, and enablers for improvement. Two hundred and six topics were identified to support the major themes, with 1966 data points. Prominent topics included ubiquitous awareness of the Bugs & Drugs reference, prescriber preferences influencing antimicrobial utilization, and desire to improve interprofessional teamwork, communication and educational opportunities.

Conclusions

This study provides information regarding AS and formulary policy perceptions of Pharmacy Services staff within AHS and Covenant Health. In order to influence change, strategies to address stakeholder perceptions should be incorporated in future projects to increase uptake and adherence.

Introduction

Antimicrobial resistance is a significant worldwide problem associated with considerable morbidity, mortality, and cost to the health care system as a whole. In the United States, antimicrobial resistant infections contribute to approximately 23,000 deaths per year.[(1)] Many of these resistant infections could be prevented.

Antimicrobial stewardship (AS) is defined as coordinated interventions designed to improve and measure the appropriate use of antimicrobial agents by promoting the selection of the optimal antimicrobial drug regimen including dosing, duration of therapy, and route of administration.[(2)] The major objectives of AS are to achieve the best clinical outcomes related to antimicrobial use while minimizing toxicity and other adverse events, thereby limiting the selective pressure on bacterial populations that drives the emergence of antimicrobial-resistant strains. AS may also reduce excessive costs attributable to suboptimal antimicrobial use.[(3)] Lastly, evidence has demonstrated that AS interventions can improve outcomes associated with antimicrobial resistance. For example, the Centers for Disease Control and Prevention recently published a report showing that AS interventions impacted prescribing of antibiotics, and subsequently resistance patterns.[(4)]

Pharmacists play an important role in AS as frontline clinicians in patient care and evaluators of medication utilization. In addition, policies have been put in place at the formulary level to improve antimicrobial usage, including restrictions, guidelines for antimicrobial use, and therapeutic interchanges (TI). There are several formulary policies and resources currently in use in Alberta Health Services (AHS) which promote the appropriate use of antimicrobial agents. The perceived effectiveness of these policies and resources, as well as potential duplication of efforts to improve antimicrobial use, has not been internally evaluated. In addition, AS initiatives are part of Accreditation Canada's Required Organizational Practices (ROP). Therefore, an audit of the policies and resources in use within AHS is a prudent first step in ensuring AHS is meeting Accreditation Canada's ROP.[(5)]

We sought to investigate Pharmacy Services staff perceptions regarding several aspects of AS, including current and legacy policies and resources, barriers to applying AS processes, and suggestions for creating a successful AS program. The intent of this document is to provide readers with an overview of the responses of focus group participants (FGPs) regarding formulary policies and antimicrobial stewardship.

Methods

Definitions

For the purposes of this project, tools have been defined as methods that specifically direct the choice of antimicrobial agents, which include but are not limited to TIs (previously known as automatic therapeutic or automatic substitutions), automatic stop dates, and formulary restrictions. Resources are considered sources of information that would assist the clinician in

choosing antimicrobial therapy. These include, but are not limited to, reference books such as Bugs & Drugs, formulary or practice guidelines, and consultations.

Study Design and Time Frame

This was a cross-sectional quality improvement study conducted at 24 sites within Pharmacy Services in AHS and Covenant Health. We used a semi-structured interview (Appendix A) to gather information from study participants in April to June 2013.

We chose a focus group approach for the method's inherent advantages[6]:

- Participants are able to interact with the moderator and each other, which produces an in-depth discussion.
- Flexibility for the moderator to probe and clarify participant responses.
- Increased FGP interest and involvement in the results and recommendations of the study.

Data Source

Employees of Pharmacy Services within AHS and Covenant Health (a faith-based parallel organization), Alberta, Canada were eligible for inclusion in this study, and were invited to participate in the focus groups via a standardized email message and email reminders. Alberta is a province of 3.6 million individuals, and all Albertans are provided publicly funded health coverage through the Canada Health Act.[7] AHS is responsible for all hospital care throughout Alberta, as well as many ambulatory care clinics.

Data Collection

Each focus group was recorded with either Microsoft Lync or Apple Word Memo. All recordings were then provided to a professional transcriptionist for the creation of transcripts for each focus group.

A sample of transcripts was reviewed by the study advisory group to identify an initial set of themes and topics. All transcripts were then evaluated by a drug stewardship summer student and drug stewardship pharmacist, who identified and coded recurrent themes, along with supporting quotations. This information was brought back to the advisory group and consensus on themes was reached by discussion. A set of major themes, sub-themes, and topics were established. The transcripts were then reviewed again to apply codes related to those themes and topics.

Analytic Plan

Depending on the type of question from the semi-structured interview, two methods of qualitative thematic analysis were applied to the transcripts:

- A conventional approach.[8] For this approach, data was taken directly from participant comments, with little or no interpretation by the study investigators. The conventional approach was used to generate a list if items mentioned by FGPs.
- A deductive approach.[9] For this approach, data points were coded by the investigators based upon participant conversations and applied to themes. Investigators were required to interpret participant responses and conversations in order to determine which theme to code the data point.

Data points were not mutually exclusive, and could be coded as "positive" if the participant comments supported the code, or "negative" if the data was unsupportive of the code. For example, Bugs & Drugs was assigned the code BD under Theme 1. If a participant mentioned that this reference was used in his/her practice, a code of BD+ was assigned. If the participant mentioned that he/she was aware of Bugs & Drugs, but it was not used in his/her practice, a code of BD- was assigned. If the topic was not mentioned at all in the transcript, no data point would have been recorded for that topic.

Microsoft Excel was used data was used for data analysis. Participant demographics were presented using summary statistics (e.g., mean and standard deviation).

Results are presented as:

- Prevalence per site. Indicates distribution of a theme/topic among the sites. The denominator was the total number of sites.
- Total mentions. Indicates the total number of times that a theme/topic occurs throughout the transcripts. Meant to represent the weight of themes/topics that are mentioned multiple times at a site. The percentage of total mentions is calculated on the total number of data points coded to that theme or topic.

Ethics Approval

We completed the A pRoject Ethics Community Consensus Initiative (ARECCI) Ethics Screening Tool to assess the ethical risk to study participants, and whether a review through a research ethics board was necessary.[10] Our project was deemed as "Minimal Risk" based on this tool and, as a result, we did not apply for ethics approval through a research ethics board, and instead used the ARECCI Ethics Guidelines for Quality Improvement and Evaluation Projects to guide this project, as recommended by ARECCI.[11]

Results

Three drug stewardship pharmacists lead 26 focus groups at 24 AHS and Covenant Health sites throughout all five AHS zones. Two sites hosted two focus group sessions, and their results have been collated into a single site. For the purposes of this document, results from AHS and Covenant Health sites are reported together.

There were a total of 200 participants, including 133 frontline pharmacists, 39 pharmacy leadership, 19 pharmacy technicians, 7 pharmacy students, and 1 Drug Utilization Evaluation Pharmacist and 1 Pharmacy Assistant. Two hundred and six topic codes (1966 data points) were identified upon final transcript review. These topic codes were catalogued into 23 sub-themes and ultimately eight major themes by consensus.
The total recording time for the focus groups was 19.2 hours, which resulted in 650 pages of transcripts.

Comparative demographics:

	Provincial	**Rural/Suburban Zones**	**Calgary Zone**	**Edmonton Zone**
Total Participants	200	85 (42.5%)	41 (20.5%)	74 (37%)
Pharmacists	125	47	31	47
Pharmacy Technicians	19	17	0	2
Leadership	47	12	10	25
Pharmacy Students	7	7	0	0
Other	2	2	0	0
# Sites	24	7 (29.2%)	7 (29.2%)	10 (41.7%)
Recording Length (minutes)	1153	422	315	416
Data Points	1966	717	600	649

Conventional data analysis was used to determine results for Themes 1, 7, and 8. Deductive analysis was used for Themes 2, 3, 4, 5, and 6.

Theme 1: Focus group participants (FGPs) identified a variety of AS resources used throughout AHS.

Topics (by total mentions)*	Prevalence (n=24)	Mentions (% of total) (n=425)
Bugs & Drugs"	24 (100%)	49 (11.5%)
Do not use Bugs & Drugs	*4 (15%)*	*4 (0.9%)*
Sanford Guide to Antimicrobial Therapy	16 (67%)	22 (5.2%)
Culture and Sensitivity Reports	17 (71%)	21 (4.9%)
Infectious Disease Consultants	19 (79%)	19 (4.5%)
Pharmacist Clinical Expectations	13 (54%)	18 (4.2%)
AHS Provincial Formulary	16 (67%)	17 (4.0%)
Restricted Antimicrobial Forms	12 (50%)	16 (3.8%)
Do not use Restricted Antimicrobial Forms	8 (33%)	7 (1.6%)
Local Antibiogram	13 (54%)	16 (3.8%)
Formulary Guidelines	15 (63%)	16 (3.8%)
Do not use Formulary Guidelines	*6 (25%)*	*6 (1.4%)*
Pre-printed Orders/Order Sets	8 (33%)	16 (3.8%)
Automatic Stop Orders	14 (58%)	15 (3.5%)
Clinical Practice Leaders	12 (50%)	15 (3.5%)

*60.4% of mentions included in table. For complete list see Appendix B.

Fifty-three unique antimicrobial references/tools were identified by FGPs. Awareness and use of Bugs & Drugs is universal in AHS. Pharmacists at every site indicated that it was used as a resource in some capacity (either paper or electronic version), but there were four sites that indicated there were services or groups of practitioners that did not use Bugs & Drugs and preferred an alternate reference. Another reference with significant mentions is The Sanford Guide to Antimicrobial Therapy.

Local antibiograms were also considered a common reference source for focus group participants. While mentioned at half of the sites, it was quoted several times that these tools have not been updated recently.

Formulary guidelines were mentioned frequently as a reference source for not only antimicrobial agents, but other medications as well. The overall number of mentions was significant, but was prevalent in only half of sites. One quarter of sites provided negative remarks about their applicability to practice.

Other resources/tools mentioned 15 or more times by FGPs may be further categorized into patient-specific (e.g. culture and sensitivity reports), practice-specific (e.g. clinical expectations), consultative (e.g. I.D. consults, Clinical Practice Leaders), or policy based (e.g. formulary, automatic stop orders).

The restricted antimicrobial forms/process was mentioned as a resource 16 times, but seven of those occurrences were coded as negative statements, indicating that the focus group participants were aware of the process but openly did not follow it.

Quotations supporting frequent themes/topics:

- Regarding utility of Bugs & Drugs: "We usually put out the Bugs and Drugs book to make sure we're covering everything that's supposed to be covered with that drug and it's not too broad spectrum."
- Regarding why Bugs & Drugs is not being used at that site: "Well some of them [physicians] want to use it but for a while it was only available as a hard copy and they're getting more into apps." "...it's also probably lack of awareness, too because Bugs & Drugs is specific to Alberta and we do get physicians from across the country." "... the ones that were trained in Calgary I find aren't as receptive to Bugs & Drugs."
- Regarding formulary policies: "I think it is nice to have [access to formulary] somewhere...to go to look things up and ...reinforce either what you want me to do or help encourage a change, because it does. I like it when it lays it out in detail what you have to do and why…"

Other Interesting Quotations:

- "...we're relying less on global initiatives or processes that would be done at DTC and more around individual pharmacists ensuring that they get appropriate drug therapy."

Theme 2: Antimicrobial utilization is <u>influenced</u> by clinicians' perceptions of patient-specific circumstances, inter/intra-professional relationships and health system processes.

Sub-themes:

- Patient specific circumstances dictate antimicrobial prescribing, despite policy, guidelines, or evidence.
- Intra and inter-professional relationships influence antimicrobial utilization
- Health system processes influence antimicrobial utilization, including:

- Clinical expectations of pharmacists
- Policies/procedures which affect drug therapy decisions
- Medication availability
- Laboratory procedures

Topics (by total mentions)*	Prevalence (n=24)	Mentions (% of total) (n=339)
Prescriber preference supersedes evidence	16 (67%)	38 (11.2%)
Frontline pharmacists are not able to focus on antimicrobial stewardship due to multiple other initiatives taking priority	11 (46%)	21 (6.2%)
Antimicrobial restrictions (forms or procedure) are perceived as an annoyance or delay therapy, rather than a decision making tool.	11 (46%)	20 (5.9%)
Antimicrobial restrictions (forms or procedure) are perceived as benefiting antimicrobial stewardship processes.	*5 (21%)*	*5 (1.5%)*
Order Sets/PPO/SCM guide appropriate antibiotic choice	12 (50%)	19 (5.6%)
Inconsistent application of formulary policies between sites/zones influence antimicrobial utilization	9 (38%)	17 (5.0%)
Lack of teamwork within programs leads to suboptimal antimicrobial prescribing	8 (33%)	15 (4.4%)
Teamwork within a program contributes to optimal antimicrobial utilization	*3 (13%)*	*5 (1.5%)*
Clinical pharmacist identified as resource for antimicrobial therapy, TDM, dose changes	8 (33%)	14 (4.1%)
Medication availability affects prescribing (e.g. shortages, physical space or distance limitations)	8 (33%)	13 (3.8%)
Insufficient patient follow up leads to continuing antimicrobials for extended period or overuse of broad spectrum antimicrobials	9 (38%)	12 (3.5%)

*44% of mentions included in table. For complete list see Appendix B.

Prescriber preference was identified as a major influence on antimicrobial utilization. Initiation or continuation of antimicrobial agents (primarily broad spectrum or by intravenous [IV] route) outside available evidence, such as culture and sensitivity reports, practice guidelines, formulary guidelines/restrictions, or clinical status of the patient, was the most prevalent and often mentioned influence. Insufficient follow-up and the prescribers' values were cited as factors contributing to this resistance to change.

FGPs perceptions of priorities and workload aside from AS influenced the clinicians' ability to apply AS principles. AS was often seen as an additional duty or responsibility, especially in areas where FGPs stated that there are already workload concerns.

Pre-printed orders (PPO)/order sets/computerized physician order entry (SCM, Sunrise Clinical Manager in place in Calgary Zone) were cited as positive influences on antimicrobial utilization. These processes limit the choice of antimicrobial agents and when written with up to date evidence, FGPs believed that they provide the best choice of antibiotic.

The utilization of antimicrobial agents is also influenced by medication availability. Product shortages, storage space or distance limitations could enable (e.g. via open stocking of restricted medications) or restrict (e.g. not having stock available until it is ordered in) the use of medications.

Antimicrobial restriction policies/forms were perceived as an acceptable stewardship tool in five sites, whereas they were perceived as an annoyance or hindering care in fifteen instances.

While there were ten mentions where a lack of teamwork results in suboptimal antimicrobial utilization, there were five examples of positive working relationships (inter- and intra-professional) that are having have positive impacts on AS processes.

Quotations supporting frequent themes/topics:

- Regarding prescriber preference and inter-professional relationships: "It depends on whether it's your hill to die on that day [and] your relationship with the rest of the team…I don't normally have any difficulties if I'm arguing with the senior resident or the fellow, or going to talk to the attending staff to plead my case …but if your attending is determined to do something, it's going to be your hill to die on if it's going to harm the patient, but I'm not sure you'd do it otherwise. You still have to work with that person."
- Regarding prescriber preference: "And you can't fault their clinical practice….If in their experience, Q8 has worked, but they've had failures on Q12, you can't argue against that, with them. If in their personal experience their patients did better, no amount of printed material [will change] their history of being a physician, when their patients have done better on …."
- Regarding pre-printed order forms, "I think patients got treated better because there was this standard of care and it was on the latest things that were appropriate."
- Regarding staff perceptions of restrictions: "…so a committee or a group of people, got together and decided and set up these guidelines …if I were to say to a physician…this is appropriate or not appropriate because of AHS guidelines, would that mean anything to them?"
- Regarding prescriber preference for utilization of broad spectrum antimicrobials: "the argument you get is, 'Well the patient's getting better on this.' But you're covering every bug in the world."
- Regarding staff perceptions of antimicrobial restrictions: "If you're making a form just to make it harder for somebody to, one more step to go to order something, that's not going to fly because if people want it, they're going to sign a form."

Other interesting quotations:

- "...if you're there at the time of prescribing and, the practitioner wants to use something that you know is a higher cost than something else that will work just as fine, then it is your responsibility to speak up."
- "…but our current system, we are, using restricted antimicrobials in situations in which they don't meet the guidelines just because we don't have somebody to assess whether or not we meet the guidelines."

Theme 3: FGPs identified multiple barriers that prevent optimal AS practices from occurring.

Sub-themes:

- Resource gaps exist that affect antimicrobial utilization and/or AS practices.
- Barriers identified that affect adherence to formulary policies or application of stewardship principles, which leads to suboptimal antimicrobial utilization.
- Barriers may be associated with formulary and third party coverage.
- Staff perceptions and attitudes affect antimicrobial utilization and/or AS processes.

Topics (by total mentions)*	Prevalence (n=24)	Mentions (% of total) (n=565)
Incomplete or patient information is available in the dispensary to make informed decisions about formulary policies.	15 (63%)	42 (7.4%)
Lack of pharmacist coverage affects ability to apply formulary policies and/or provide AS processes.	14 (58%)	42 (7.4%)
Inconsistent or unclear expectations affect patient outcomes or pharmacists' ability to apply AS principles.	10 (42%)	26 (4.6%)
Antimicrobial restrictions (policy or forms) are perceived as ineffective.	8 (33%)	17 (3.0%)
Staff "choose" to follow formulary policies based on the perceived value of the policy.	9 (38%)	16 (2.8%)
Unclear, difficult to access or interpret online formulary, policies, guidelines.	9 (38%)	16 (2.8%)
Pharmacist apathy, passivity, or lack of confidence in making interventions and/or recommendations.	11 (46%)	15 (2.7%)
Pharmacists do not want be perceived as "drug police".	10 (42%)	15 (2.7%)
Formulary policy communication is not considered effective for frontline staff.	9 (38%)	14 (2.5%)
When formulary policies/processes are inconsistently applied, inappropriate utilization of antimicrobials occurs.	10 (42%)	13 (2.3%)
The list of TI's and Formulary Restrictions/Criteria are too lengthy to remember/enforce	11 (46%)	13 (2.3%)
Non-existent antimicrobial utilization reports	8 (33%)	13 (2.3%)
Differences between AHDBL and AHS formulary (including special authorization, formulary listing) increases workload	5 (21%)	13 (2.3%)

*45% of mentions included in table. For complete list see Appendix B.

FGPs identified many barriers (35 unique codes) to implementing or carrying out AS practices. There is a relatively flat distribution of responses in this theme, with the most prominent topics accounting for 7.4% of total responses. Sub-theme groupings of Policy/Procedure and Perception/Attitudes barriers were the most frequently mentioned areas, followed by Resource Gaps. Barriers attributed to Formulary/Coverage were the least cited.

Incomplete patient information available at the time of order entry to enforce formulary policies (e.g. restrictions) or make AS decisions was cited most frequently among the sites (68% of the time).

Lack of pharmacist coverage was identified as a barrier to policy adherence and stewardship efforts at 58% of sites, and was mentioned as often as barriers associated with incomplete information.

Attitudes towards workload and practice expectations were identified by FGPs as significant barriers. Participants held perceptions that workload priorities required their focus elsewhere, coupled with the lack of or inconsistent expectations for AS within their practices, resulted in apathy, passivity, or lack of confidence when dealing with AS processes and/or adhering to formulary policies. There were also examples where pharmacy staff indicated that they do have the passion and/or confidence to make significant clinical interventions. The rate was approximately one-half of the incidences of apathetic or passive comments.

FGPs did state that there are sufficient resources to apply AS principles, and those formulary policies were helpful for the clinician in their practices ten times throughout the transcripts. These were concentrated to three sites.

Quotations supporting frequent themes/topics:

- Regarding pharmacist coverage: "…big services like general surgery, they are big antibiotic users. They don't have a pharmacist at all."
- Regarding information available in the dispensary: "So when the pharmacists are in the dispensary, screening orders and fielding calls about antimicrobials… their area of expertise might be quite different and they may not be familiar with the medication that they're being asked about."
- Regarding communication and accessibility of information: "I think pharmacists know [how to access the formulary], but people prescribing the drugs may not know where to access it." "Who's going to read through that [online formulary restrictions] when they're prescribing it, right?" "…it is a nightmare for the pharmacists to keep track [of when there are formulary changes]…it decreases our credibility with the team because there's a lot of confusion."
- Regarding pharmacists not seeing their role as drug police: "So at some point you have to let the physicians do what their supposed job is. But we know they need a lot of policing…so if it doesn't present immediate harm, there's only so much you can do in a day."
- Regarding selecting which policies to adhere to: "...these forms would be going to basement and in all honesty they don't have time to be looking at forms to assess for appropriateness."
- Regarding pharmacist expectations: "It is important to "educate all the pharmacists as to what you want them to do…and have them communicate that."

Other interesting quotations:

- Regarding the perception of pharmacists being drug police: "And if I spent my whole day calling physicians, asking them to change something solely based on cost, I wouldn't have

felt like I was really doing my due diligence and doing a good job. I would have felt like I was just chasing the dollar."

- Regarding inter-professional relationships and workload: "..you don't know what's causing the problem, try getting a doctor on the phone to explain themselves? There's no accountability in that circumstance, and they don't really want to talk to you anyways, because quite frankly talking to me doesn't make them any money at all."

Theme 4: A <u>team approach</u> is essential to the creation of an effective AS program.

Sub-themes (by total mentions)*	Prevalence (n=24)	Mentions (% of total) (n=92)
Proactive, interdisciplinary teams should include "ID experts", clinical practice leaders, physicians, medical microbiologists, and other healthcare professionals.	13 (54%)	44 (30.4%)
Physician involvement and buy-in is required for successful implementation of any program	17 (71%)	32 (34.8%)
Future efforts need to be coordinated across AHS programs and zones in a stepwise, timely fashion with a clear philosophy on formulary policies and stewardship efforts.	6 (25%)	14 (15.2%)
Physician advocates required to improve antimicrobial utilization	8 (33%)	9 (9.8%)
Infectious Disease specialist (Rx or MD) presence is a positive influence for staff	6 (25%)	7 (7.6%)

*100% of mentions included in table.

FGPs stated throughout the interviews that the most desirable approach to AS is proactive (prior to antimicrobial order is written), rather than reactive (traditional dispensary based approach). Establishing that practice in interdisciplinary teams, that include access to infectious disease (ID) specialists (identified as either physician or pharmacist) was an over-represented view point in this theme.

When reviewing the transcripts, two sites were identified where a proactive, team approach was currently in place and positively affecting antimicrobial use.

Ensuring prescriber involvement and buy-in to either AS processes and/or formulary policies was identified by FGPs as an essential component to improve antimicrobial utilization.

FGPs also recognized that recommendations and plans for future AS efforts should be coordinated across zones/sites, and include clear goals and philosophies.

Quotations supporting frequently mentioned themes/topics:

- Regarding building an effective interdisciplinary team with clear expectations and philosophy: "...each department has somebody who participates and it works really well because everybody understands, and knows all the other disciplines involved. There are

goals that have been agreed upon that you're working towards so you have something measurable, and then you break it down over time and everyone manages to get things going forward when sometimes they seem insurmountable, at the end of the day you actually got somewhere."

- Regarding prescriber buy in: "In order for you to really impact physicians' prescribing, it has to come from the physician. We have been involved in many initiatives and then we come off looking like policeman and that's not our role. We're collaborators."
- Regarding physician buy in: "...I think we don't always hold [physicians] accountable to the extent that we need to and …if we're going to set up this program [we need to ensure] that accountability flows back [to the physicians] and [pharmacy] is seen as a supporting department."
- Regarding effective team work influencing antimicrobial stewardship: "When the change over day is coming...the pharmacist sometimes is writing in there saying, today is day 11 of therapy of this antibiotic for this indication, with a little small synopsis so far, so at least the person coming on knows they've already been on it for 11 days, because sometimes it's kind of hard to tell with those sheets that you get in your chart."

Other interesting quotations:

- Regarding building an effective team: "I'd just like to say, that whatever is being designed here, be careful not to make it feel like it's finger pointing at groups being responsible or wrong…"

Theme 5: Inter-professional and intra-professional education is required to improve AS.

Sub-theme:

- Physicians, pharmacists, nurses, and trainees should be offered evidence based education on a regular basis.

Topics (by total mentions)*	Prevalence (n=24)	Mentions (% of total) (n=119)
Increase physician and staff knowledge and understanding of formulary policies/guidelines and AS processes will improve outcomes.	14 (58%)	30 (25.2%)
Physicians require further antimicrobial education	12 (50%)	18 (15.1%)
Continued education should be evidence-based and timely	9 (38%)	13 (10.9%)
Pharmacists require further antimicrobial education	8 (33%)	11 (9.2%)
Nurses require further antimicrobial education	8 (33%)	11 (9.2%)
Pharmacists have a lead role in educating staff about formulary policies and AS principles	7 (29%)	9 (7.6%)
Different educational strategies will be required to influence AS depending on physician background (e.g. use of hospitalists vs. community-based general practitioners vs. locums)	5 (21%)	9 (7.6%)
Residents/trainees should receive an antimicrobial refresher course	7 (29%)	7 (5.9%)

*91% of mentions included in table. See Appendix B for complete list.

In this theme, there is a topic/code for statements regarding each of physicians, pharmacists and nurses. Educational needs for physicians was identified more often (50% prevalence amongst sites) than either pharmacists or nurses (33%).

For topics relating to a specific issue regarding education (e.g. continuing education should be evidence based and timely) data points were coded regardless of the specific profession mentioned. Education on formulary policies and AS principles was identified most often as areas on which to focus efforts on.

The structure of future educational efforts was identified by participants. These included recommendations that these programs be timely and evidence based, flexible for the target audience's educational practice, and involve pharmacists as a leader in educating others.

Quotations supporting frequently mentioned themes/topics:

- Regarding identifying education on formulary policies for prescribers: "Isn't that the physician's responsibility to ensure that those restrictions are met before they prescribe…we do have some physicians who really do not look at what they should be doing, they just basically do what they think is [correct]…"
- Regarding pharmacists' role in educating others: "I think as pharmacists we need extra training too, because I do see the medical residents struggle with the antimicrobials and they have actually made comments that they don't get enough training in antimicrobials."
- Regarding using different approaches to achieve education goals: "It's not just education, it's a process. You might have really high-functioning pharmacists who need a better strategy or a better approach or more information, but you also have people who just don't know where to start. So it's not a one-size-fits-all kind of thing."
- Regarding pharmacists' role and educational needs: "I think pharmacists could be a lot better gatekeepers of [antimicrobial use], but I think it's not emphasized in the training that AHS is offering."

Other interesting quotions:

- Concerning participant's frustration with accessible educational opportunities: "I feel very inadequate to be doing the job that I'm doing, because I lack education on all fronts. And the education to become competent in those areas is not accessible."

Theme 6: In order for AS tools and processes to be effectively incorporated into day-to-day practice, inter/intra-professional, leadership and program level communications must be effective, clear and easily understood.

Sub-themes (by total mentions)*	Prevalence (n=24)	Mentions (% of total) (n=42)
Staff Rx need to feel comfortable with the rationale when making recommendations based on formulary policies/guidelines	94 (38%)	12 (28.6%)
Formulary communication (newsletters, updates) are not communicated effectively. Should be concise and easy	6 (25%)	11 (26.2%)

to read with clear take home messages		
Formulary policies (e.g. therapeutic interchanges, restrictions) need be logical and easy to follow in order to properly enforce them	8 (33%)	10 (23.8%)
Increased contact between zones and programs will encourage sharing of ideas and problem solving	3 (13%)	5 (11.9%)
Areas have multiple groups looking at the same issue-communication and expectations work between groups are inconsistent	4 (13%)	4 (9.5%)

*100% of mentions included in table.

Communication is a recurrent theme mentioned throughout the focus group interviews, and is integral to all other themes. The three most frequently mentioned topics identified issues regarding the effectiveness of formulary policy communication. FGPs identified that policies with clear objectives and rationale are needed for frontline staff when enforcing and communicating policies to prescribers.

Formulary update recommendations (e.g. increased exposure, include key messages) were mentioned on par with the remaining two topics.

Mentions of intra-zone communication included statements that there needs to be increased sharing of information between zones to ensure consistent messaging and streamline workload.

Quotations that support frequent topics:

- Regarding clarity of communications and comfort with rational: “A lot of that formulary information [is] not always effectively communicated to us.” “Well I sure couldn’t tell you what the restricted drugs were...where do we find that information quickly?”
- Regarding rationale for formulary policies: “I think there is a lack of knowledge and understanding of even what is the most cost effective….because we don’t do a very good job of telling them.”
- Regarding groups that develop formulary policies:“...they’re very good at making policies, but not necessarily very good at disseminating the information to front line staff, who are then expected to follow them.”

Theme 7: Antimicrobial utilization <u>concerns</u> were identified by FGPs.

Topics (by total mentions)*	Prevalence (n=24)	Mentions (% of total) (n=147)
Inappropriate vancomycin use or TDM concerns	11 (46%)	21 (14.3%)
Inappropriate use of carbapenems	13 (54%)	19 (12.9%)
Overuse of piperacillin-tazobactam	12 (50%)	19 (12.9%)
Suboptimal IV therapy in outpatient setting. (e.g. drugs dosed for convenience or continued inappropriately)	8 (33%)	13 (8.8%)
Inappropriate use of ceftriaxone	8 (33%)	12 (8.2%)
Inappropriate treatment of UTI	6 (25%)	12 (8.2%)
Overuse of clindamycin	4 (17%)	7 (4.5%)
Suboptimal use of antimicrobials on surgical units	3 (13%)	6 (4.1%)

Inappropriate use of linezolid	3 (13%)	5 (3.4%)
Overuse of antimicrobials in ICU	4 (17%)	4 (2.7%)
Overuse of aminoglycosides	3 (13%)	4 (2.7%)

*83% of mentions included in table. See Appendix B for complete list.

When asked about their concerns about antimicrobial utilization at their sites, focus group participants identified 25 topics. We grouped these by medication, program/site, and condition/diagnosis categories.

Medication specific:
Perceptions that there is overuse or misuse of three broad spectrum antimicrobial agents or classes (vancomycin, piperacillin-tazobactam, and carbapenems) were cited most often by focus group participants. Concerns regarding the appropriate utilization and workload involved with the therapeutic drug monitoring (TDM) of vancomycin were identified by FGPs was mentioned the most often. Vancomycin is labour intensive for pharmacy services (i.e. involves CIVA mixing, laboratory monitoring often falls on pharmacists, and follow-up communication with prescribers that add to complexity), and has inherent patient safety problems (e.g. nephrotoxicity) that would benefit from optimizing its use.

Program/site:
Inappropriate antimicrobial utilization in outpatient areas (i.e. emergency departments and home parenteral settings) was the most frequently mentioned area with antimicrobial utilization concerns. These involved the choice of agent (e.g. spectrum, toxicity), route of administration (e.g. IV when oral administration may be appropriate), duration of therapy, lack of follow-up, and workload issues. There were also unclear expectations of the pharmacists' roles in enforcing formulary policies in these areas.
Antimicrobial utilization on surgical units and ICUs were identified as one of the top ten concerns.

Condition concerns:
Focus group participants mentioned concerns regarding the diagnosis or treatment of UTIs 12 times. Perceptions of the appropriateness of antimicrobial prescribing, influence of other processes (e.g. routine urinalysis) and professions (e.g. nursing asking for antibiotics) supported this topics.
Antimicrobial utilization in acute exacerbation of chronic obstructive pulmonary disease (AECOPD) was mentioned as a concern by FGPs.

Quotations that support frequent cited topics:

- Regarding the workload and appropriateness of vancomycin TDM: "it seems like word is getting out that 1 g Q12 isn't appropriate for everybody for vancomycin because it seems like more services are ordering it weight-based and looking at renal function...the levels are usually brutal. I think we waste a lot of money."

- Regarding the use of carbapenems: "Well in our outpatient clinics, for cellulitis they've gone to using ertapenem as opposed to cefazolin or clinda. I guess it's just because of ease of once a day dosing, but it's just gone rampant here."
- Regarding the use of broad spectrum cephalosporins: "they're using ceftriaxone inappropriately, for anybody who walks through the door. Cellulitis, pneumonia, anything."

Theme 8: FGPs suggested ideas in the areas of human resources, education, policies, resources and reporting as <u>enablers</u> for a successful AS program.

Topics (by total mentions)*	Prevalence (n=24)	Mentions (% of total) (n=195)
Technology is required to enable optimal clinical decisions.	11 (46%)	19 (9.7%)
An antimicrobial stewardship process or pharmacist, with a clearly defined role and responsibilities to address antimicrobial stewardship issues.	9 (38%)	19 (9.7%)
Having updated guidelines accessible to all health care providers.	12 (50%)	15 (7.7%)
Accurate and consistent utilization data is required to make intervention decisions.	10 (42%)	13 (6.7%)
Resources that are user friendly and supportive of front line staff needs.	9 (38%)	12 (6.2%)
Future initiatives require dedicated leadership and timelines, clear communication to staff, and measurable outcomes.	8 (33%)	12 (6.2%)
Clinical decision making tools/prompts available	7 (29%)	10 (5.1%)
Standardized references - follow one resource i.e. Bugs & Drugs or Sanford	6 (25%)	9 (4.6%)
System in place that flags antimicrobials with a high cost, requires TDM, or needs step-down	5 (21%)	9 (4.6%)
Facility affiliated medical microbiologist added to team	7 (29%)	7 (3.6%)
Increased clinical pharmacist time and/or coverage	5 (21%)	6 (3.1%)
Including duration of therapy and indication with antimicrobial orders	4 (17%)	6 (3.1%)

*70% of mentions included in table. See Appendix B for complete list.

FGPs identified 36 ideas or principles that would be desirable in future AS program development. The program would have dedicated leadership and timelines, provide clear communication to staff, include measurable outcomes, and integrate accurate and consistent utilization data in order to make intervention decisions.

FGPs stated that implementing technology that would enhance clinical decisions involving AS and ensuring that AS processes (or staff) have a clear role and responsibilities were mentioned the most frequently.

FGPs desired having guidelines and resources that are updated frequently, accessible to all health care providers, provided in a user friendly format, and flexible to support front line staff needs. These could be integrated into clinical decision tools.

At four sites, participants stated that having prescribers include the indication and length of antimicrobial therapy would facilitate AS processes and streamline workload and communication problems.

Quotations that support frequent themes/topics:

- Regarding having technology support clinical decisions: "If you could have a Google search, where you pull up the drug…and it gives [you the information you requested] to you rather than reading and reading and reading."
- Regarding accessibility to formulary policies: "...it's not a fault of our resources but it's a fault of our system that doesn't actually make them easily accessible."…..It would be nice to have some portability of some of the therapeutic interchanges and the formulary...to the floors
- Regarding reporting and utilization: "...we don't know how often therapeutic interchanges occur. We don't know what categories are utilized, not only just within the hospital but within the zone or the province. We don't really measure [TI instances]…and therefore we don't have feedback to reinforce the behaviour or squelch bad behaviour."

Other interesting quotations:

- Regarding expanding pharmacist services: "...you can put as many websites, clinical practice guidelines, charts and algorithms, but until you get a pharmacist up there to go with the physicians and review charts…you're not going to reach the goal."
- Regarding technology enabling decision making: "Having nursing and doctors know [cost] at the point of prescribing, because they don't always think about it and who's going to pay when [the patient is] discharged."

Discussion

Qualitative studies that utilized focus groups to determine the culture of medication use involving antimicrobials have been described in literature.[12,13] Previous studies describe themes including the influence of senior practitioners on prescribing patterns and targeting education and communication strategies on that group[14], and prescribers justifying deviance from guidelines due to patient or system factors.[15] These literature themes resonated with our focus group participants. Although there is evidence for the pharmacists' role in AS programs[16,17], we are unaware of previous studies of this type that focused on pharmacy services (pharmacists, leadership and pharmacy technicians) to examine the issue of AS and perceptions of formulary policies. We believe that the direction of current programs and projects, and the development of new initiatives would be best served by addressing the themes of this document.

The primary objective of the study was accomplished by an inventory of resources listed in Theme 1. The complete list can be found in Appendix B. The AS resource that was most readily identified is the Bugs & Drugs reference. The 2012 update of Bugs & Drugs was released in the months preceding the focus group interviews, but not all participants had access to the most recent version. An iPhone app roll out was ongoing at the time of the interviews.

Perceptions on AS and formulary policies, addressing our second objective, were elaborated upon with the remaining seven themes. In many instances, themes and topics overlapped. Examples included:

- Antimicrobial formulary restrictions were identified as a resource, but also influenced antimicrobial utilization and were perceived as a barrier to optimal AS practices. Communication and education on this formulary policies was identified frequently as enablers.
- Pharmacist coverage (or lack of) was identified as a barrier, and figured prominently as part of the team work and enabler themes.
- Physician and specialist involvement were identified as resources, influenced antimicrobial utilization (positively and negatively), and acted as barriers to adherence to formulary policies. Involving these groups in AS teams, as well as in communication and education initiatives constituted the most common mentions within those themes.
- Stakeholder perceptions of the effectiveness of formulary policies were often linked to barriers and influences to adhering to those policies. These could be linked to perceptions about frontline staff attitudes towards enforcing these policies, essentially resistance to being the "drug police".

This project provided insight into the culture of medication within Pharmacy Services. Perceptions shape the culture of a profession or organization[18], and need to be addressed to enable change, regardless of evidence whether the perceptions are factual or not. The data resulting from these focus groups, as stated earlier, are the perceptions of focus group participants. The inherent power of perceptions is that they provide a glimpse into the beliefs of staff and will allow decision makers to understand what issues need to be addressed to facilitate practice change. When moving forward with AS projects, taking these perceptions into account may allow for more tailored interventions and increased uptake.

Substantial time and effort is put into researching and developing formulary policies that influence AS processes. Ultimately, frontline staff are the "gatekeepers" to adhering to these policies and ensuring AS processes are applied to patient care. In order to be effectively applied, staff voiced need to have a clear understanding of the rationale and expected outcomes of these policies. This study demonstrated that frontline staff perceive that communication is not always clear or effective, and provide examples of enablers that may improve it.

Participants expressed that unclear expectations/priorities, workload issues and pharmacist coverage affected their ability to apply formulary policies and AS processes. There was also the perception that AS was a entity separate of the regular patient care processes, and is best served by ID experts or teams. Many AS principles can be integrated into routine patient care, if staff are comfortable with the principles and informed that they are expected to include them in their practice.

Future communication and educational strategies should be created in a manner such that the information is clear and succinct, and includes rationale and outcomes for the clinician.

However, health care in Alberta cannot be delivered uniformly. The diversity of patient populations, facilities, practitioner availability and training necessitates that policies and programs are flexible to meet the needs of practitioners throughout the province.

As with most research, our study does have limitations that must be noted. There is no uniform approach to the analysis of qualitative research[9], so the combination of conventional and deductive analysis may be seen as a unique approach to the questions posed in this study. In addition, recording problems (e.g. extensive background noise, computer issues, and participants speaking over each other) resulted in portions of some interviews being non-transcribable. It is possible that data points were excluded. The bulk of data coding was performed by a single investigator. However, we do not believe this had a significant impact on the results of this study because the advisory group was consulted to ensure consensus for the identified themes and topics.

Invitations were extended to all pharmacy staff in AHS and Covenant Health. Two hundred participants chose to take part, representing 10.7% of Pharmacy Services staff (1864 regular and part time staff). It is generally assumed that the healthcare workforce in Alberta is split into thirds - ⅓ in each of Edmonton, Calgary and rural/suburban zones. In this project, the split of participants was 42.5% from rural/suburban (n = 85), 37% Edmonton (n = 74), and 20.5% Calgary (n = 41).

Lastly, tertiary sites (e.g. Royal Alexandra Hospital, University of Alberta Hospital, Foothills Hospital) had fewer participants (3, 4 and 3, respectively) than other sites (average of 7.7 participants/site). Interview recording length was 32, 30 and 33 minutes respectively for these sites, which are significantly shorter than the average length (44 minutes). This relates back to volunteerism bias[19], and as a result, generalizabilty of the results should be cautioned.

It is also important to note that pharmacists represent a single discipline within the health care team, therefore results of this study may not apply to other professions involved with antimicrobial stewardship.

Other limitations of focus group research noted in the literature include participants intellectualizing or making up their responses to impress the interviewers, and producing trivial results as a consequence of dominant personalities or poor group dynamics. Several of the focus groups consisted of a mix of frontline pharmacists, pharmacy technicians, clinical practice leaders, and ID specialists. It is possible that junior staff or “generalists” may have been intimidated to speak during these sessions, for fear of disagreeing or presenting views not consistent with more senior staff or “specialists”.

Conclusion:

FGPs identified resources, influences on and barriers to providing AS, as well as site-specific concerns regarding antimicrobial use. The responses provided by FGPs will be considered when designing and implementing future AS programs within AHS and Covenant Health.

Report Disclaimer:

The intent of this report is to be a resource for readers. Recommendations on how to pursue or fix issues identified by the FGPs are not within the scope of this report.

The results of this project will be communicated to frontline staff and leadership. This document and zone specific reports will be published on the Drug Stewardship and Antimicrobial Stewardship SharePoint pages for access to anyone within Alberta Health Services or Covenant Health. A manuscript on the design and outcomes of this type of project is being planned to be submitted for publication.

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List of Abbreviations

AECOPD - Acute exacerbation of chronic obstructive pulmonary disease
AHDBL - Alberta Health Drug Benefit List
AHS – Alberta Health Services
ARECCI - A pRoject Ethics Community Consensus Initiative
AS – Antimicrobial stewardship
DTC – Drugs and Therapeutics Committee
FG – Focus groups
FGP – Focus group participants

ICU – Intensive care unit
ID – Infectious disease
IV – Intravenous
MD – Medical doctor
PPO – Pre-printed order
ROP – Required Organizational Practice
Rx – Pharmacist
SCM – Sunrise Clinical Manager
TDM – Therapeutic drug monitoring
TI – Therapeutic interchange
UTI – Urinary tract infection

Appendix A

Assessment of Current Antimicrobial Stewardship Policies and Resources: Semi-structured Interview Guide

Project Objectives:

The objectives of this project are to:

1. Identify antimicrobial stewardship processes currently in use in AHS.
2. Evaluate stakeholder perception of the effectiveness of current formulary policies and resources.

Principles of Semi-structured Interviewing:

Semi-structured interviewing requires a formal interview guide – a written list of questions and topics that need to be covered in a particular order.

Formal, written interview guides are necessary particularly when several interviewers are gathering information - this ensures reliable, comparable data across interviewers.

Focus on the participants. The objective is to gather evidence/feedback, not direct or criticize practice.

Probing may be necessary to stimulate a response to produce more information, but it is important to probe without injecting yourself so much into the interaction that you only get a reflection of yourself in the data.

Examples of probing:

- Silent probe – keep quiet and wait for a respondent to continue, or another for respondent to pick up where the first left off.
- Echo probe – repeat the last thing someone has said and ask him or her to continue.
- Tell-me-more probe – “Could you tell me more about that?”, “Can you give me an example?”
- Do not use leading questions “When you said…, did you mean…?” – instead ask “What did you mean when you said…?”

LISTEN MORE, TALK LESS!

Interview Introduction:

Thank you for agreeing to take part in this interview. My name is _____ _____ and I am from the AHS Drug Stewardship Program. Members of the drug stewardship team are conducting interviews throughout AHS to collect information on antimicrobial stewardship activities at each site. The purpose of this interview is to gather your feedback on antimicrobial stewardship at your site. Participation in this interview is completely voluntary, and should take approximately 60 minutes. Your responses will be recorded anonymously and are completely confidential. Feedback received from all sites will be combined to produce a clear picture of antimicrobial stewardship activities in AHS, and will be used to guide future antimicrobial stewardship initiatives.

Are there any questions before we begin the interview?

Question #1: What antimicrobial stewardship processes (or tools or initiatives or policies) are you aware of?
Question #2: What methods do you currently use to guide appropriate antimicrobial use for your patients?
Question #3: As discussed in question 1, formulary policies (e.g. therapeutic interchanges, restrictions, forms) are a component of antimicrobial stewardship within AHS. • Are these applied in your practice/site/program? • What are the benefits you see of these policies? • What are the harms/costs of these policies? • What barriers are there to applying these policies?
Question #4: Antimicrobial stewardship resources (e.g. Bugs & Drugs, formulary guidelines, etc.) are promoted to help frontline staff encourage the appropriate use of antimicrobials. • Are these use/applied in your practice/site/program? • What are the benefits of the resources? • What barriers are there to using these resources?
Question #5: Do you have concerns about antimicrobial use at your site? • If NO – move to question 6. • If YES – ask interviewees: What are your concerns?
Question #6: Do you feel that there are times when orders for restricted antimicrobials are dispensed without ensuring that they meet the process? If clarification of restriction methods/process required, include Antimicrobial Forms, ID consults, etc. • If NO – move to question 8. • If YES – ask interviewees: o Which medications? o Why do you feel this happens?
Question #7: Looking specifically at the formulary guidelines, are they used to make patient care decisions at your site? • If NO – move to question 8. • If YES – ask interviewees: o Can you tell me how they are used to make patient care decisions? o Are there aspects of the formulary guideline process that you feel are

beneficial? Why or why not?
Question #8: If you were designing an antimicrobial stewardship program where you work, what key elements/tools would you incorporate?
Question #9: Is there anything else you would like to discuss? • If NO – move to conclusion of the interview.

Interview Conclusion:
Thank you for agreeing to take part in this interview. As mentioned in the introduction, your responses will be combined with the feedback from the other sites to produce a clear picture of antimicrobial stewardship activities in AHS. These results will then be available to all staff and will be used to guide future antimicrobial stewardship initiatives.

Appendix B - All Topics and Codes

Codes used by the investigators have been included in this appendix to assist with interpreting frequency graphs included in Appendix C.

Theme #1 Antimicrobial Stewardship Resources/Tools:

Coding of topics in this theme was directly extracted from transcripts. Little interpretation was done by the reviewers to include data into topics (conventional method).

References	Resources/Procedures
● Bugs & Drugs (BD) ● "Johns Hopkins antimicrobial reference" (JH) ● Parenteral manual (PM) ● "Sanford Guide"(S) ● "UpToDate"(UTD) ● "Lexicomp" (LC) ● "The Medical Letter" Guidelines (MLG) ● "Red Book" (RB) ● Pharmacokinetic Booklet (PKB) ● Dynacare Lab Book (DCLB) ● Infection prevention and control guidelines (IPC) ● VRE Guidelines (VREG) ● MRSA Guidelines (MRSAG) ● Clinical Practice Guidelines (CPG) ● IDSA (IDSA) ● UTI (UTI) ● "Towards Optimized Practice" CPGs (TOP) ● Febrile Neutropenia Guidelines (FNG) ● Primary literature/Literature Searches (PL)	Local: ● Local antibiogram (LA) ● "ID gems" (IG) ● Order Sets/Pre-printed orders/SCM (PPO) ● Therapeutic Drug Monitoring protocols (TDM) ● Culture and sensitivity (CLT) ● Netcare/EMR (NC) ● 72 h Antibiotic Review (72AR) ● Pharmacy software alerts or automated reports ("pop-ups") (MTPU) ● Locally developed guidelines or policies (LOC) ● Other pharmacists/colleagues (OTH) ● C.difficile protocol (CDP) Provincial: ● Former Health Region Policy (FHRP) ● AHS Formulary (AF) ● AHS Formulary Guidelines (AFG) ● Formulary Restrictions (FR) ● Restricted antimicrobial forms (RAF) ● Therapeutic Interchanges (TI)

	● IV to PO Step-down policy (IV2PO) ● Automatic Stop Order policy (ASO)
Professional Resources ● Clinical Practice Leaders (CPL) ● Infectious Diseases consults (IC) ● Infectious Diseases pharmacists (IP) ● Medical Microbiologist (MM) ● DUE Pharmacist (DUEP) ● Drug/antimicrobial Stewardship Pharmacist (DSP) ● CSHP - PSN (CSHP) ● Drug Stewardship Initiative Orientation (DSIO)	Miscellaneous ● Clinical expectations for pharmacists (CEP) ● Clinical acumen/patient assessment skills (ACU) ● Antimicrobial Stewardship Committee (ASC) ● Ad hoc committees (AHC) ● Surgical prophylaxis initiative (SHN) ● Antimicrobial Stewardship Program (ASP) ● Medication Postings (MP)

Theme #2 Influences:

Sub-themes are broad generalizations by the reviewers taken from the context of participant responses to facilitators' questions. Topics are codes derived from quotes or paraphrases of participant dialogue.

Patient Specific Circumstances	Professional Dynamics (I2.0)
● Broad spectrum (empiric) antimicrobial therapy continues despite indication to narrow or streamline therapy. This is driven by (I1.0): o Prescribers' values (I1.1) o Opinion leaders/specialists ability to impact prescribing (I1.2) o A perception that " the patient is getting better" (I1.3) o Insufficient patient follow up (I1.4) o A fear of litigation (I1.5) ● The ability to easily administer parenteral antimicrobials while admitted to hospital (I1.6) ● Culture and Sensitivity not routinely ordered (B3.7) ● Prescriber preference supersedes evidence (I2.3) ● Prescribers lack of confidence in abilities/diagnosis results in inappropriate prescribing of antimicrobials (I2.5) ● Broad spectrum antibiotics are being prescribed to facilitate shorter length of stay (I3.3)	● Medical residents learn from attending physicians' antimicrobial prescribing practices (I2.1) ● Incomplete or delayed physician to physician communication delays antimicrobial therapy decisions or leads to suboptimal antimicrobial use (I2.4) ● Lack of team work within programs leads to suboptimal antimicrobial prescribing (I2.6) ● Nursing requests influence antimicrobial utilization at times where it may not be appropriate (e.g. UTI) (I3.4) ● Incomplete medical history/charting prevents clinicians ability to make antimicrobial stewardship decisions (I3.6) ● When professions choose different antimicrobial references, it causes confusion and/or increased workload when applying formulary policy and/or antimicrobial stewardship principles (I3.7)

Clinical expectations (I2.2)	Health System Influences
● Clinical pharmacist identified as resource for antimicrobial therapy, TDM, dose changes (I3.1) ● Ongoing therapy reassessment (I2.2.3) ● Enforcement of formulary policies (I2.2.1)	Policies and Procedures: (I4.0) ● Antimicrobial restrictions (forms or procedure) are perceived as an annoyance or delay therapy, rather than decision making tool. (I4.1) ● Order Sets/PPO/SCM guide appropriate antimicrobial choice (I4.2) ● Frontline pharmacists are not able to focus on antimicrobial stewardship due to multiple other initiatives (e.g. MedRec, VTE, etc.) taking priority (I4.3) ● Prescribers unaware of policies/procedures, guidelines (I4.4) ● Inconsistent application of formulary policies between sites/zones influence antimicrobial utilization (I4.5) Medication availability: ● Medication shortages influence prescribing of antimicrobials (I5.1) ● Physical space restrictions or distance prevent all medications being available (I5.3) Lab: ● Lack of awareness of laboratory procedures affects antimicrobial choice (I3.5) ● Culture and sensitivity reports may not include or correspond with formulary guidelines/restrictions (I6.1) ● Limited availability or delay in reporting of lab test or drug levels impact antimicrobial prescribing (B3.12)

Theme #3 Barriers:

Sub-themes are broad generalizations by the reviewers taken from the context of participant responses to facilitators' questions. Topics are codes derived from quotes or paraphrases of participant dialogue.

Formulary and Coverage Barriers (B1.0) ● Differences between AHDBL and AHS formulary (including special authorization,	Barriers associated with formulary policy adherence or application of antimicrobial stewardship principles (B2.0)

formulary listing) increases workload (B1.1) ● Confusion between prior regional formulary and provincial formulary (B1.3) ● Discrepancies between formulary and antimicrobial references/guidelines (e.g. Bugs & Drugs) exist (B1.4)	<u>Resource related:</u> ● The list of Therapeutic Interchanges and Formulary Restrictions/Criteria are too lengthy to remember/enforce (B2.1) ● Formulary policy communication is not considered effective for frontline staff (C3.2) ● Alert ("pop-up") fatigue results in non-adherence with formulary policies (B2.2) <u>Workload associated:</u> ● Formulary policies and antimicrobial stewardship processes may not be applied at times of high volume or workload. (B2.11) ● When formulary policies/processes are inconsistently applied, inappropriate utilization of antimicrobials occurs. (B2.6) ● Incomplete patient information available in the dispensary to make informed decisions about formulary policies. (B2.5) ● Changes to PPO/order sets are difficult to influence or change quickly (B2.10) ● Outpatient/Home Parenteral Therapy administration add to workload. Pharmacy has little influence at the time of prescribing. (RD3)

Resource gaps (B3.0)	Staff perceptions and attitudes (B4.0)
● Lack of pharmacist coverage affects ability to apply formulary policies and/or provide antimicrobial stewardship processes. (B3.1) ● Lack of local level decision making ability (e.g. P&T) has negatively affected antimicrobial stewardship and/or formulary policy application (B3.8) Resource gaps to assist in making antimicrobial stewardship decisions: ● Limited access to computers on units (B3.4) ● Unclear, difficult to access or interpret online formulary, policies, guidelines (B2.3) ● Poor physician access to AHS resources/education (e.g. Insite) (B3.15) ● Lack of a current antibiogram (B3.5) ● Non-existent antimicrobial utilization reports (B3.9) ● Lack of a non-formulary process creates inconsistency on how formulary policies are adhered to (B2.7) ● No Infectious Disease pharmacists available (B3.10) ● IT/pharmacy system issues hamper consistent application of formulary policies/antimicrobial stewardship (RD2)	● Pharmacists do not want be perceived as "drug police". (TA4) ● Inconsistent or unclear expectations affects pharmacist outcomes or ability to apply antimicrobial stewardship processes. (B4.2) ● Pressures of multiple initiatives/priorities cause staff and/or leadership to "choose" areas to focus on. (B4.3) ● Pharmacist apathy, passivity, or lack of confidence in making interventions and/or recommendations. (B4.4) ● Ability for pharmacist to contact prescriber in order to influence antimicrobial therapy is not available. (B4.5) ● Frontline pharmacy staff do not feel supported by management. (B4.6) ● Staff "choose" to follow formulary policies inconsistently based on perceived value of the policy. (B4.7) ● Formulary policies are seen as economic in nature only (C3.3) ● Antimicrobial restrictions (policy or forms) are perceived as ineffective. (B1.5) ● Influence of clinician perspective on antimicrobial use versus actual utilization data (RD4)

Theme #4 Team Approach:

Sub-themes are broad generalizations by the reviewers taken from the context of participant responses to facilitators' questions. Topics are codes derived from quotes or paraphrases of participant dialogue.

- Future efforts need to be coordinated across AHS programs and zones in a stepwise, timely fashion with a clear philosophy on formulary policies and stewardship efforts. (TA1)
- Proactive, interdisciplinary teams could include "ID experts", clinical practice leaders, physicians, medical microbiologists, and other healthcare professionals. (TA3.0)
- Supporting topics:
- Infectious Diseases specialist (Rx or MD) presence is a positive influence for staff (TA3.1)
- Physician advocates required to improve antimicrobial utilization (TA3.4)
- Physician involvement and buy-in is required for successful implementation of any program (TA5)

Theme #5 Education:

Sub-themes are broad generalizations by the reviewers taken from the context of participant responses to facilitators' questions. Topics are codes derived from quotes or paraphrases of participant dialogue.

- Continued education should be evidence based and timely (E2.2)
- Different educational strategies will be required to influence antimicrobial stewardship depending on physician background (e.g. use of hospitalists vs. Community based General Practitioners vs. locums) (I3.2)
- Increase physician and staff knowledge and understanding of formulary policies/guidelines and antimicrobial stewardship processes (E1.3)
- Awareness of antimicrobial costs (E1.5)
- Appropriateness of Vancomycin TDM (E1.1)
- Residents/trainees should receive an antimicrobial refresher course (E1.2)
- Mentorship expectations include proper antimicrobial use (ENS12)
- Infectious Diseases pharmacists and specialists have responsibility to educate peers (E1.7)
- Pharmacists have a lead role in educating staff about antimicrobial stewardship policies. (E2.3)

Theme #6 Communication:

Sub-themes are broad generalizations by the reviewers taken from the context of participant responses to facilitators' questions. Topics are codes derived from quotes or paraphrases of participant dialogue.

- Formulary policies (e.g. therapeutic interchanges, restrictions) need to be logical and easy to follow in order to properly enforce them (C1.1)
- Formulary communication (newsletters, updates) are not communicated effectively. Should be concise and easy to read with clear take home messages (C1.2)
- Staff Rx need to feel comfortable with the rationale when making recommendations based on formulary policies/guidelines (C1.4)
- Increased contact between zones and programs will encourage sharing of ideas and problem solving (C4.1)
- Areas have multiple groups looking at the same issue- communication and expectations between groups are inconsistent (B6)

Theme #7 Concerns:

Coding of topics in this theme was directly extracted from transcripts. Little interpretation was done by the reviewers to include data into topics (conventional method).

- Inappropriate vancomycin use or TDM concerns (RD1.9)
- Overuse of broad spectrum antimicrobials (RD1.4)
- Overuse of piperacillin-tazobactam (RD1.1)
- Inappropriate use of ceftriaxone (RD1.3)
- Overuse of ceftazidime (RD1.18)

- Inappropriate use of carbapenems (RD1.15)
- Overuse of amoxicillin/clavulanate (RD1.6)
- Inappropriate use of linezolid (RD1.23)
- Condition specific:
- Inappropriate treatment of UTI (RD1.19)
- Incidence of MRSA (RD1.26+)
- Improper treatment of pneumonia (RD1.27+
- Inappropriate use of antimicrobials in the treatment of AECOPD(RD1.5)
- Overuse of clindamycin (RD1.7)
- Overuse of minocycline (RD1.12)
- Overuse of acyclovir (RD1.14)
- Overuse of aminoglycosides (RD1.16)
- Inappropriate use of nitrofurantoin (RD1.17)
- Overuse of fluoroquinolones (RD1.20)
- Inappropriate use of metronidazole (RD1.22)
- Inappropriate anaerobic coverage due to confusion with TIs (RD1.10)
- Suboptimal IV therapy in outpatient setting. (e.g. drugs dosed for convenience, or continued inappropriately) (RD1.13)
- Continued use of cefazolin post-op (RD1.21)
- Overuse of antimicrobials in ICU (RD1.2)
- Suboptimal use of antimicrobials on surgical units (RD1.24)
- IV therapy used when PO is appropriate (RD1.25)

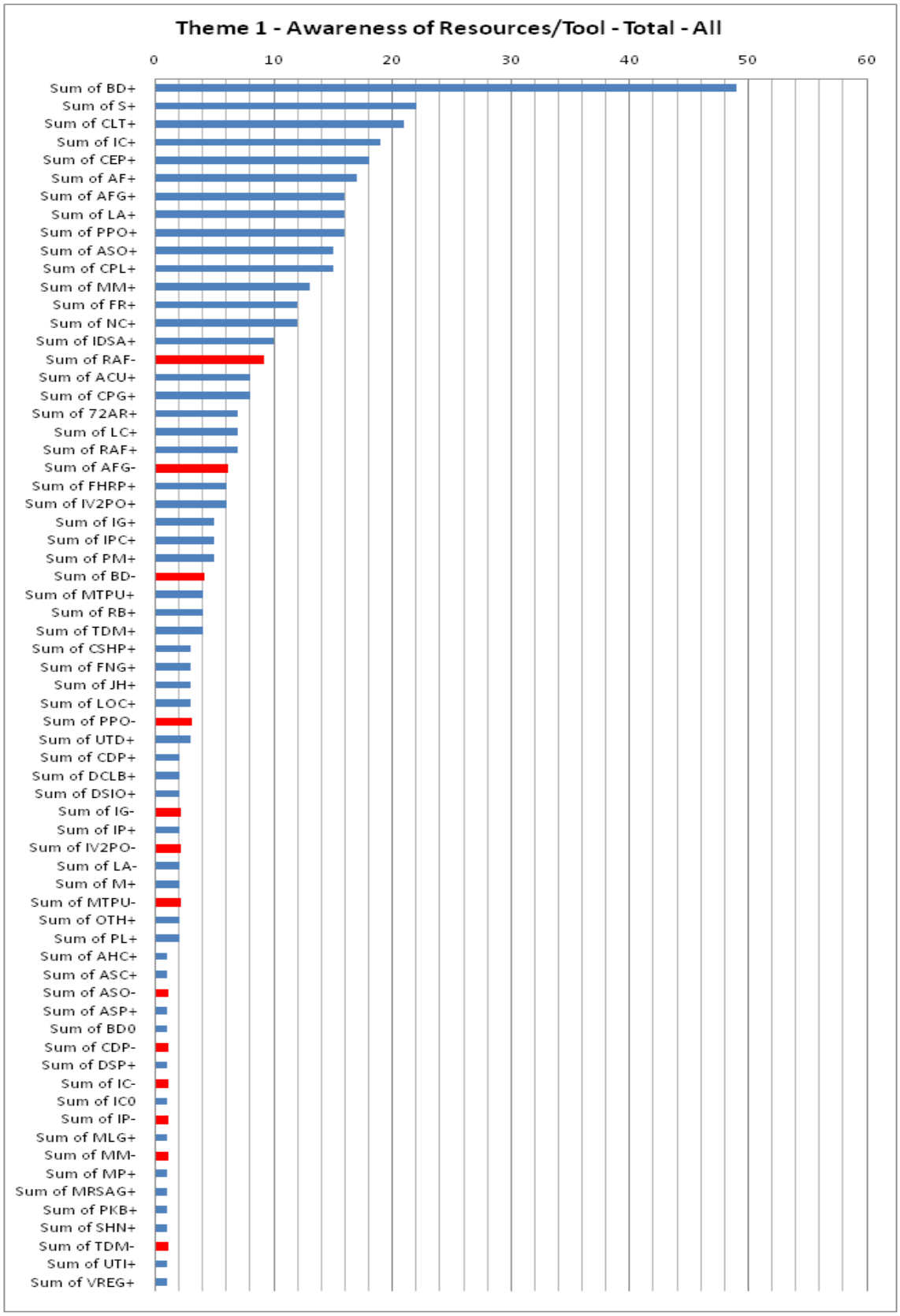
Theme #8 Enablers:

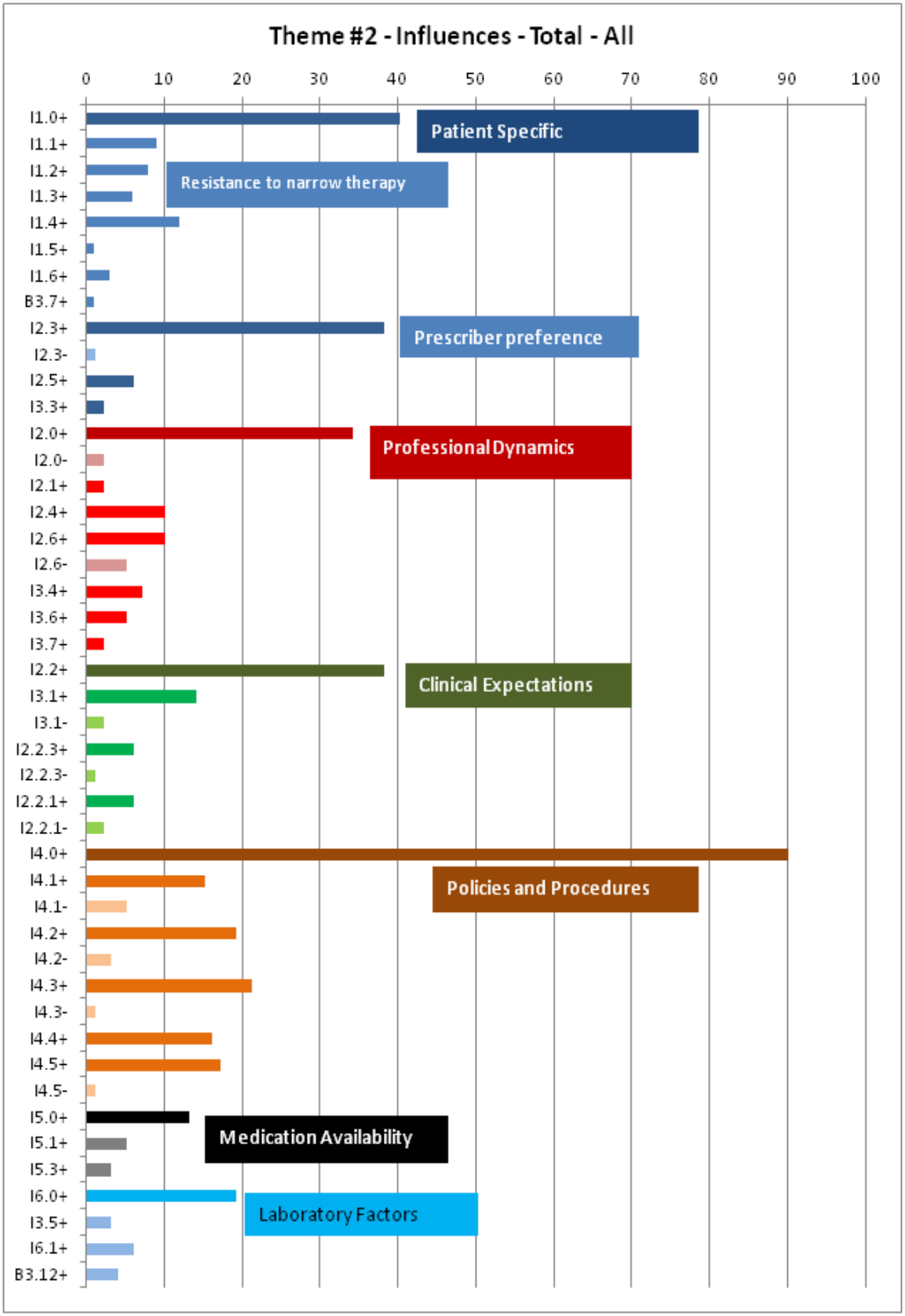
Coding of topics in this theme was directly extracted from transcripts. Little interpretation was done by the reviewers to include data into topics (conventional method).

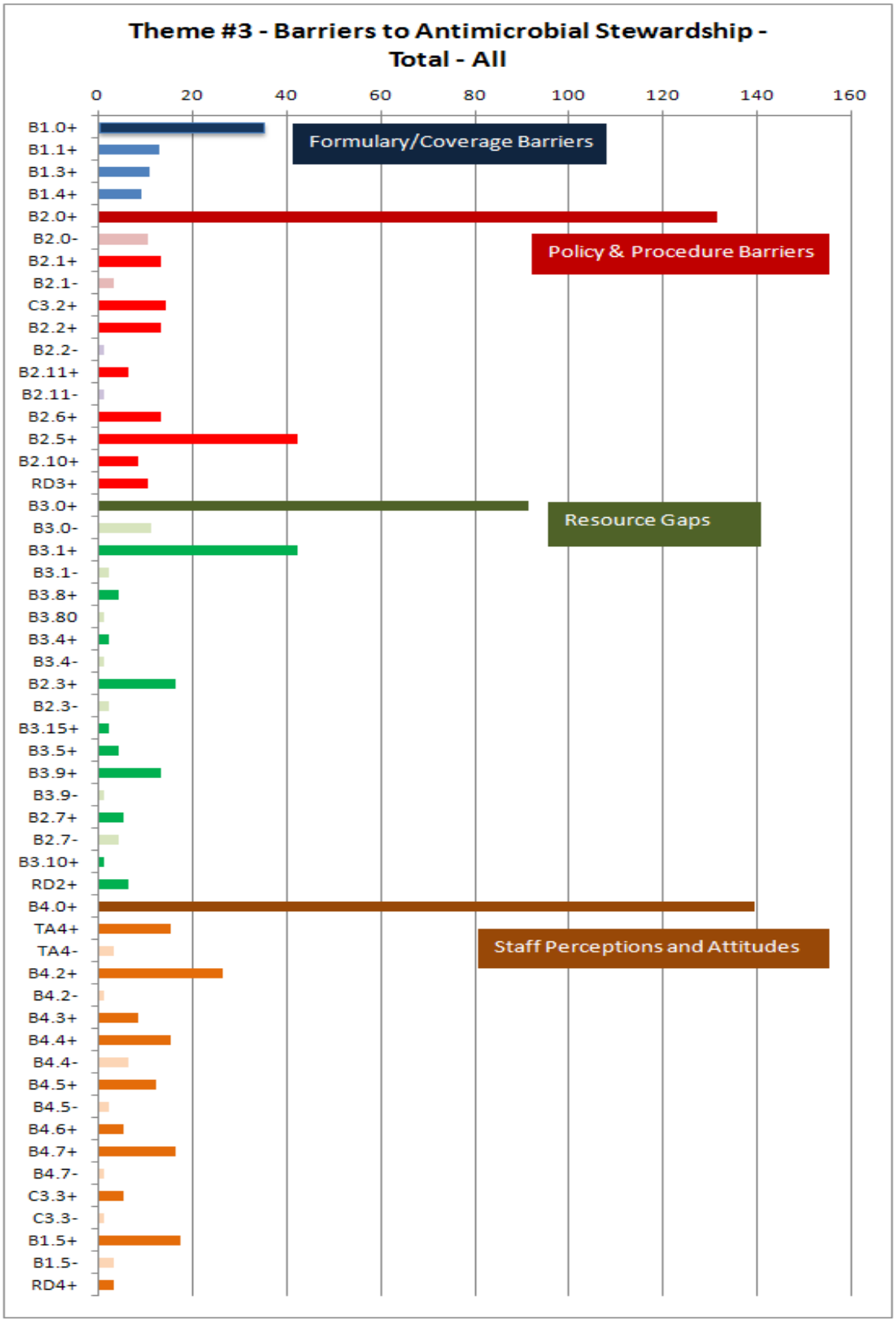
Staffing or program specific recommendations:	Policies:
• Majority of admissions come through ER-target proactive interventions here (ENS1) • An antimicrobial stewardship process or pharmacist, with a clearly defined role and responsibilities to address antimicrobial stewardship issues (ENS2) • Future initiatives require dedicated leadership and timelines, clear communication to staff, and measurable outcomes (ENS3) • Increased clinical pharmacist time and/or coverage (ENS4)	• Universal protocol to take swabs or culture prior to starting antimicrobial therapy (ENP3) • Structured antimicrobial therapy guides: step-down - IV/PO or spectrum narrowing, kidney function dose adjustments, etc. (ENP4) • Infectious Diseases Pre-printed orders or pathways (ENP5) • Alignment of restrictions/availability with DBL (ENP6) • Escalation policy or guide to resolve conflicts (ENP7) • Including duration of therapy and indication with antimicrobial orders (ENP8)

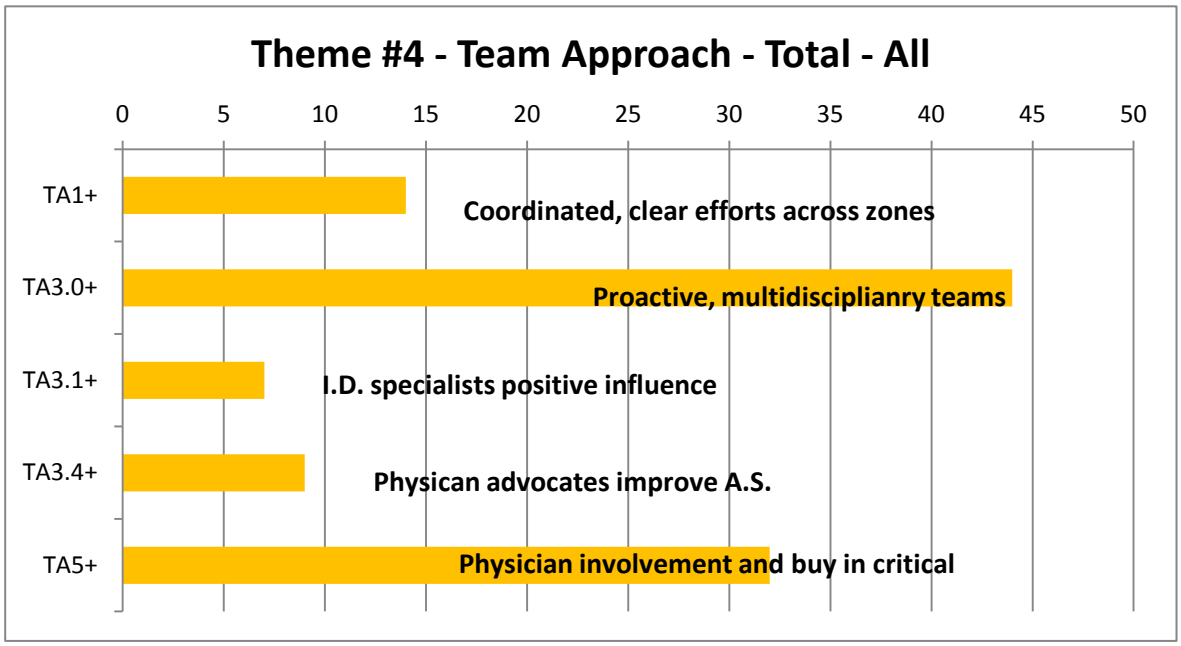
• Engagement of staff and Drug Stewardship Program coming to pharmacists creating buy-in (ENS6) • Facility affiliated medical microbiologist added to team (ENS9) • Recruited certified Infectious Disease specialist - medical (ENS10), pharmacist (ENS8) • Use of Clinical Pharmacy Support Technicians (ENS13) • Clinical Practice Leaders to engage in antimicrobial stewardship, regardless of specialty (TA3.2) • LTC formulary required (ENP2) • Antimicrobial stewardship has to take cost and patient outcomes into account (ENP1)	• Policy to restrict location of restricted antimicrobials (i.e. not in wardstock) (ENP9) • All pharmacists to obtain and utilize APA (ENS15)
<u>Resources:</u> • Updated guidelines accessible to all health care providers (ENR1) • Standardized references - follow one resource i.e. Bugs & Drugs or Sanford (ENR2) • Current Antibiogram (ENR3) • Resources (e.g. Pharmacy web site, antimicrobial stewardship tools) that are user friendly and supportive of front line staff needs (ENR4) • Academic detailing service (ENR5) • Antimicrobial Stewardship Binder/manual (ENR6) • Technology required to enable optimal clinical decisions (ENR8) • Clinical decision making tools/prompts available (ENR9) • Create condition/disease specific education programs for physicians and staff (ENR12) • Streamlining (LEAN) of order entry process (ENS16) • Telehealth or online access to education or consults (ENS14)	<u>Reporting:</u> • Accurate and consistent utilization data is required to make intervention decisions (END1) • System in place that flags antimicrobials with a high cost, requires TDM, or needs step-down (END2) • System to alert clinicians about antimicrobial costs (END3) • Strengthen relationship with lab to influence what antibiotics are reported (ENR11) • DOSE/EBI (aka financial/drug use tracking ability) (ENR10)

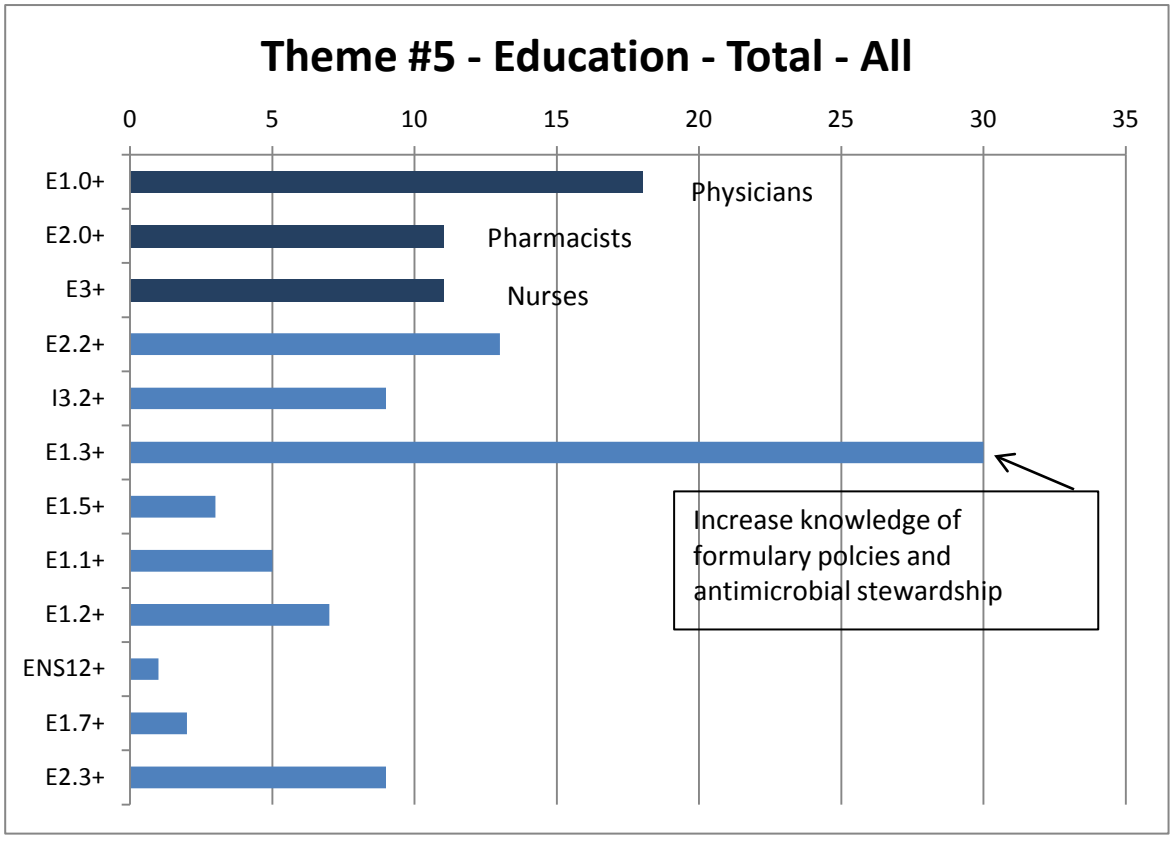
Appendix C – Frequency Graphs

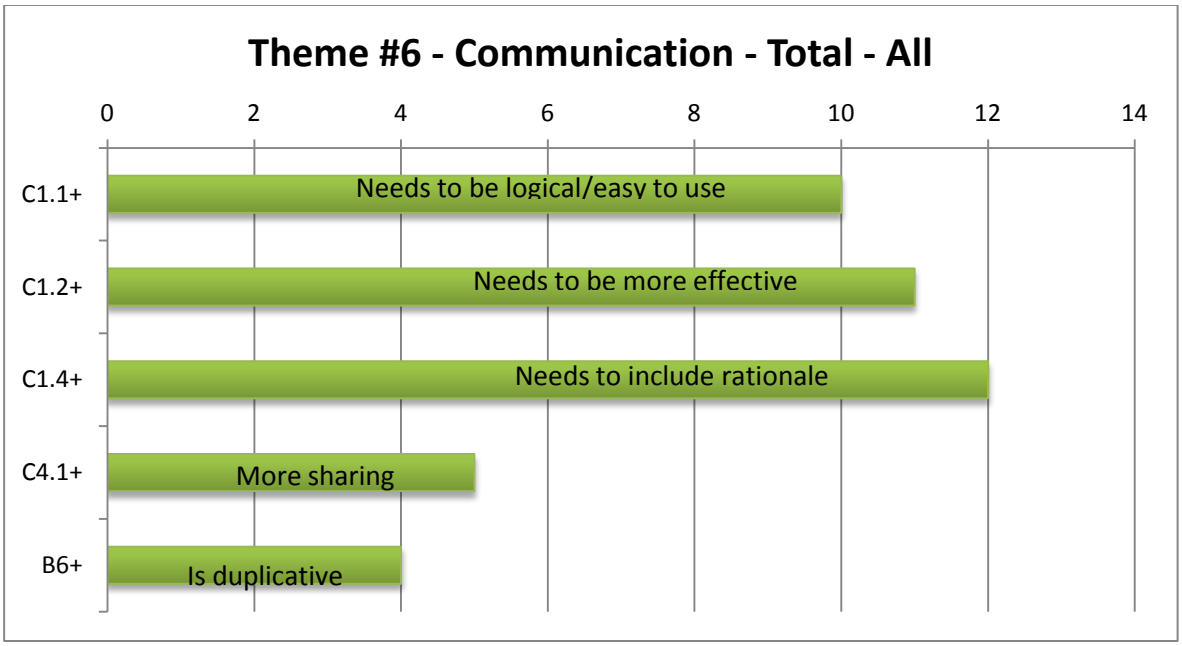


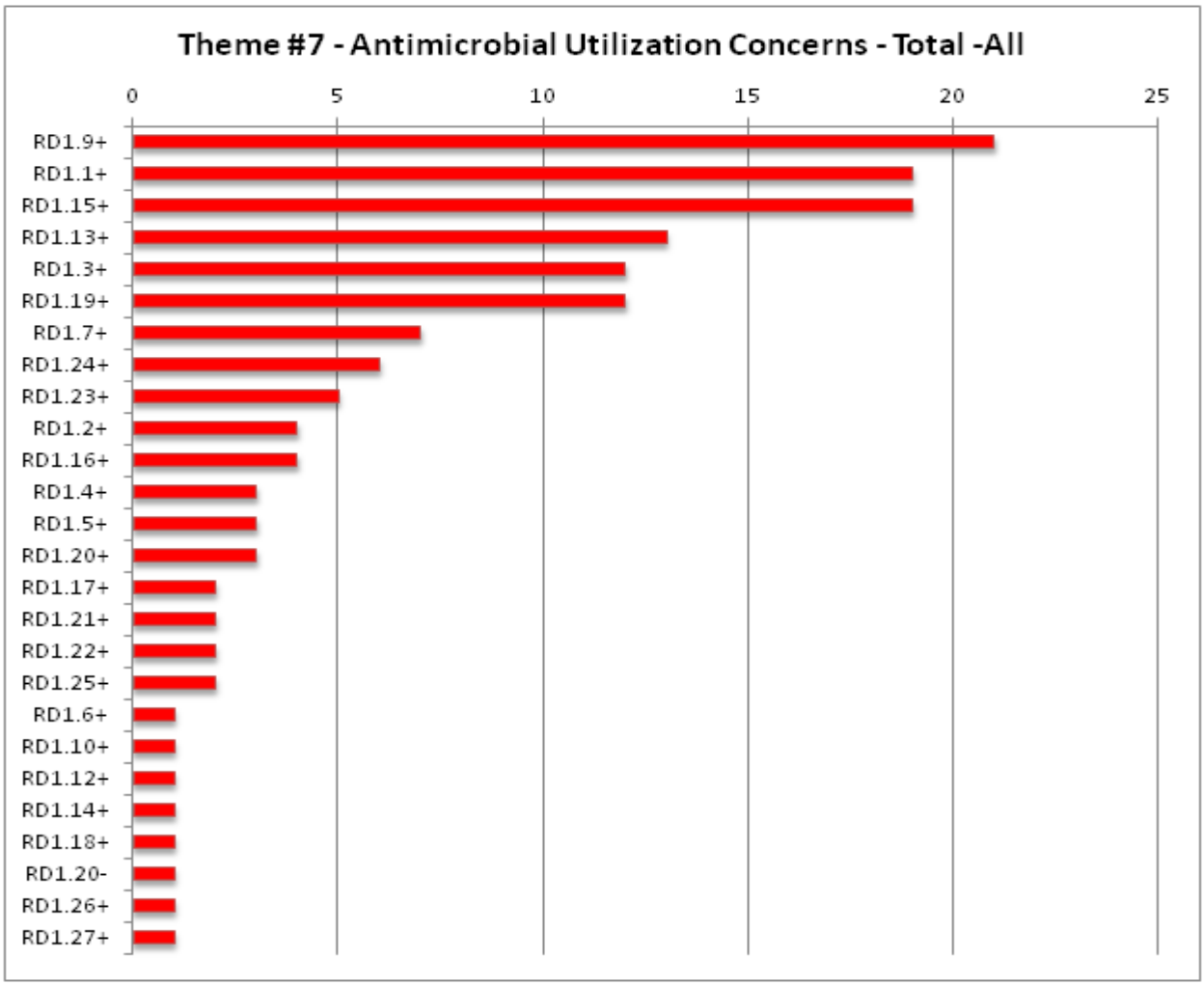

Theme #2 - Influences - Total - All
0
10
20
30
40
50
60
70
80
90
100
I1.0+
I1.1+
I1.2+
I1.3+
I1.4+
I1.5+
I1.6+
B3.7+
I2.3+
I2.3-
I2.5+
I3.3+
I2.0+
I2.0-
I2.1+
I2.4+
I2.6+
I2.6-
I3.4+
I3.6+
I3.7+
I2.2+
I3.1+
I3.1-
I2.2.3+
I2.2.3-
I2.2.1+
I2.2.1-
I4.0+
I4.1+
I4.1-
I4.2+
I4.2-
I4.3+
I4.3-
I4.4+
I4.5+
I4.5-
I5.0+
I5.1+
I5.3+
I6.0+
I3.5+
I6.1+
B3.12+
Patient Specific
Resistance to narrow therapy
Prescriber preference
Professional Dynamics
Clinical Expectations
Policies and Procedures
Medication Availability
Laboratory Factors

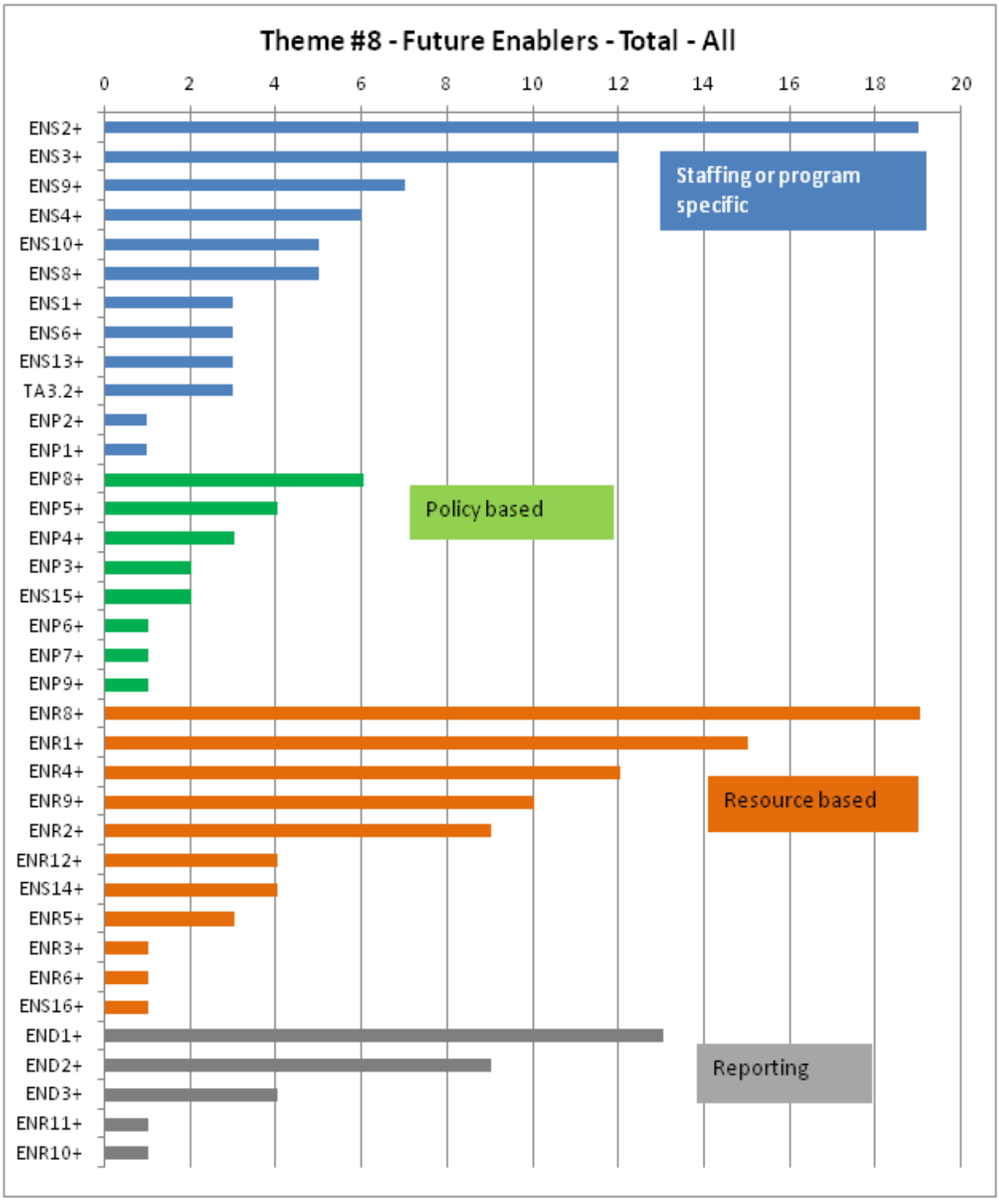

Theme #3 - Barriers to Antimicrobial Stewardship - Total - All
0
20
40
60
80
100
120
140
160
B1.0+
B1.1+
B1.3+
B1.4+
B2.0+
B2.0-
B2.1+
B2.1-
C3.2+
B2.2+
B2.2-
B2.11+
B2.11-
B2.6+
B2.5+
B2.10+
RD3+
B3.0+
B3.0-
B3.1+
B3.1-
B3.8+
B3.80
B3.4+
B3.4-
B2.3+
B2.3-
B3.15+
B3.5+
B3.9+
B3.9-
B2.7+
B2.7-
B3.10+
RD2+
B4.0+
TA4+
TA4-
B4.2+
B4.2-
B4.3+
B4.4+
B4.4-
B4.5+
B4.5-
B4.6+
B4.7+
B4.7-
C3.3+
C3.3-
B1.5+
B1.5-
RD4+
Formulary/Coverage Barriers
Policy & Procedure Barriers
Resource Gaps
Staff Perceptions and Attitudes


Theme #4 - Team Approach - Total - All
0
5
10
15
20
25
30
35
40
45
50
TA1+
Coordinated, clear efforts across zones
TA3.0+
Proactive, multidisciplianry teams
TA3.1+
I.D. specialists positive influence
TA3.4+
Physican advocates improve A.S.
TA5+
Physician involvement and buy in critical


Theme #5 - Education - Total - All
0
5
10
15
20
25
30
35
E1.0+
Physicians
E2.0+
Pharmacists
E3+
Nurses
E2.2+
I3.2+
E1.3+
E1.5+
E1.1+
E1.2+
ENS12+
E1.7+
E2.3+
Increase knowledge of formulary polcies and antimicrobial stewardship


Theme #6 - Communication - Total - All
0
2
4
6
8
10
12
14
C1.1+
Needs to be logical/easy to use
C1.2+
Needs to be more effective
C1.4+
Needs to include rationale
C4.1+
More sharing
B6+
Is duplicative


Theme #7 - Antimicrobial Utilization Concerns - Total -All
0
5
10
15
20
25
RD1.9+
RD1.1+
RD1.15+
RD1.13+
RD1.3+
RD1.19+
RD1.7+
RD1.24+
RD1.23+
RD1.2+
RD1.16+
RD1.4+
RD1.5+
RD1.20+
RD1.17+
RD1.21+
RD1.22+
RD1.25+
RD1.6+
RD1.10+
RD1.12+
RD1.14+
RD1.18+
RD1.20-
RD1.26+
RD1.27+


Theme #8 - Future Enablers - Total - All
0
2
4
6
8
10
12
14
16
18
20
ENS2+
ENS3+
ENS9+
ENS4+
ENS10+
ENS8+
ENS1+
ENS6+
ENS13+
TA3.2+
ENP2+
ENP1+
ENP8+
ENP5+
ENP4+
ENP3+
ENS15+
ENP6+
ENP7+
ENP9+
ENR8+
ENR1+
ENR4+
ENR9+
ENR2+
ENR12+
ENS14+
ENR5+
ENR3+
ENR6+
ENS16+
END1+
END2+
END3+
ENR11+
ENR10+
Staffing or program specific
Policy based
Resource based
Reporting