



Drug Stewardship Program
"Effectiveness, Safety, and Sustainability"

**Assessment of Current Antimicrobial Stewardship Policies and
Resources: Project Report –Calgary Zone**

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Introduction

There are several formulary policies (e.g. therapeutic interchanges, restrictions) and resources (e.g. Bugs and Drugs, culture and sensitivity reports) used in Alberta Health Services (AHS) which promote the appropriate use of antimicrobial agents (1). The use of these policies and resources, as well as potential duplication of efforts to improve antimicrobial use, has not been evaluated within AHS. As antimicrobial stewardship initiatives are part of Accreditation Canada's Required Organizational Practices (ROP) (2), an audit of the policies and resources in use within AHS was a necessary first step in ensuring AHS is meeting Accreditation Canada's ROP.

Objectives

The objectives of this study were to:

1. Identify existing antimicrobial stewardship processes within AHS; and
2. Assess staff perceptions of the utility and effectiveness of those processes and related formulary policies within AHS.

AHS Drug Stewardship Council approved this project in February 2013, and the project was lead by the AHS Drug Stewardship Team.

Methods

Study Design, Time Frame, and Focus Group Locations

We used a cross-sectional qualitative study design to measure the study objectives (3,4).

Twenty six focus groups (FGs) were conducted with AHS Pharmacy Services staff at 24 sites throughout Alberta in June 2013. FGs in Calgary included: Alberta Children's Hospital, Calgary Pharmacy Management, Foothills Medical Centre, Peter Lougheed Centre, Rockyview General Hospital, South Health Campus, and South Clinical Practice Leaders (CPLs).

Data Collection

A nine question, semi-structured interview was used to guide the FG sessions (Appendix A). The Drug Stewardship Pharmacists conducted the FGs in their respective zones. Whenever possible, FGs were conducted in person. If this was not possible, FGs were conducted over Microsoft Lync. All FGs were recorded, and the recordings were sent to a transcriptionist to produce transcripts of each FG.

Analysis

Based upon the type of question asked by the focus group moderator, two methods of qualitative thematic analysis were applied to the transcripts:

1. A conventional approach, where data was taken directly from participant comments (5). Little or no inference was applied by investigators, and generated a list of items mentioned by focus group participants.
2. A deductive approach where data was coded by the investigator group based upon participant conversations and applied to themes identified by the investigators and provincial Antimicrobial Stewardship Committee (ASC) members (6). This required the investigators to read meaning into participant responses and conversations.

A pharmacy summer student and one lead investigator reviewed all transcripts, noting concurrence to those themes and coding sub-themes and topics that identified any emerging themes/topics. The investigator team reviewed and consolidated all themes, sub-themes, and topics (see Appendix B for a complete list). The transcripts were then re-read and coded for analysis. Positive data points reflected participant comments that supported the code as interpreted by the reviewers. Negative data points identify instances in the data that were unsupportive of the code. For example, “Bugs & Drugs” was given the code BD as a response to question 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.

Codes were analyzed for prevalence (how universal a theme is across sites) and total number of mentions (how often the theme is mentioned). Zone-based mentions were reported as a proportion of the total provincial mentions in each table.

Definitions

- Prevalence – number of FG sites where a theme was mentioned, divided by the total number of FG sites (n = 24).
- Mentions – total number of times a theme was mentioned.
- Resources – Sources of information that would assist the clinician in selecting antimicrobial therapy. These include, reference books/texts, formulary or practice guidelines, and professional consultations.
- Theme – General proposition that emerged from comments and conversations by focus group participants and provide a recurrent and unifying idea.
- Topic – Specific quotes or paraphrases from the transcripts, which provide evidence to support a theme.
- Tools – Formulary policies or methods that specifically direct the choice of antimicrobial agents. These include therapeutic interchanges (previously known as automatic therapeutic substitutions), automatic stop dates, and formulary restrictions.

Results

Table 1. Comparative Demographics of the Focus Group Population

| | Provincial | Calgary Zone (% of total) |
|------------------------------------|-------------------|----------------------------------|
| Total participants | 200 | 41 (20.5%) |
| Pharmacists | 133 | 31 (23.3%) |
| Alberta Children’s Hospital | | 4 |
| Foothills Medical Centre | | 3 |
| Peter Lougheed Centre | | 6 |
| Rockyview Hospital | | 7 |
| South Health Campus | | 11 |
| Pharmacy Technicians | 19 | 0 (0%) |
| Pharmacy Leadership | 39 | 10 (25.6%) |
| Pharmacy Management | | 3 |
| Clinical Practice Leaders | | 7 |
| Pharmacy Students | 7 | 0 (0%) |
| Other | 2 | 0 (0%) |
| Number of Focus Groups | 26 | 7 (26.9%) |
| Total Recording Length | 1153 minutes | 315 minutes (27.3%) |
| Data Points | 1966 | 600 (30.5%) |

Themes and Topics

Theme 1: Focus group participants identified a variety of antimicrobial stewardship resources used throughout AHS.

| Frequently Used Resources | Calgary Zone | | All Sites | |
|---------------------------------|---------------------|--------------------|----------------------|----------------|
| | Total Sites (n = 7) | Total Mentions | Total Sites (n = 24) | Total Mentions |
| Bugs & Drugs | 7 (100%) | 9 (18%) | 24 (100%) | 49 |
| AHS Formulary Restrictions | 6 (85.7%) | 7 (58.3%) | 11 (45.8%) | 12 |
| ID Consults | 6 (85.7%) | 11 (57.9%) | 13 (54.2%) | 19 |
| Sanford Guide | 6 (85.7%) | 9 (40.9%) | 17 (70.8%) | 22 |
| AHS Formulary Guidelines | 5 (71.4%) | 7 (43.8%) | 13 (54.2%) | 16 |
| 72 Hour Review | 5 (71.4%) | 6 (85.7%) | 6 (25%) | 7 |
| Local Antibiogram | 5 (71.4%) | 8 (50%) | 15 (62.5%) | 16 |
| Culture and Sensitivity Reports | 4 (57.1%) | 5 (23.8%) | 17 (70.8%) | 21 |
| Resources Not Used | Instance (n = 7) | Total Mentions (%) | Instance (n = 24) | Total Mentions |
| Bugs & Drugs | 4 (57%) | 3 (75%) | 5 (21%) | 4 |
| AHS Formulary Guidelines | 3 (43%) | 3 (50%) | 6 (25%) | 6 |

FG participants identified 53 unique resources/tools. Similarly to provincial totals, Calgary Zone focus group participants at every site recognized the Bugs & Drugs reference as an antimicrobial stewardship resource they use. When compared to provincial instances and mentions, formulary restrictions, ID consults, Sanford Guide, formulary guidelines, and 72 hour review were identified as resources more often in the Calgary zone than AHS as a whole. In terms of negative instances, Bugs & Drugs and AHS Formulary Guidelines were most frequently mentioned as not being used within participants' clinical practice, and most often was mentioned that prescribers the pharmacists work with did not use Bugs & Drugs.

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

| Factors That Influence Antimicrobial Utilization | Calgary Zone | | All Sites | |
|---|---------------|----------------|----------------|----------------|
| | Sites (n = 7) | Total Mentions | Sites (n = 24) | Total Mentions |
| Prescriber preference supersedes evidence | 6 (85.7%) | 13 (34.2%) | 16 (66.7%) | 38 |
| Inter-/Intra-professional relationships influence antimicrobial utilization | 6 (85.7%) | 12 (35.3%) | 18 (75%) | 34 |
| Prescribers unaware of policies/procedures, guidelines | 4 (57.1%) | 9 (56.3%) | 9 (37.5%) | 16 |
| Inconsistent application of formulary policies between sites/zones | 4 (57.1%) | 9 (52.9%) | 9 (37.5%) | 17 |
| Ordersets/PPO/SCM guide appropriate antimicrobial choice | 3 (42.9%) | 5 (26.3%) | 12 (50%) | 19 |

Respondent perception that prescriber preference superseded available evidence was cited the most often as influencing antimicrobial utilization. Evidence could be culture and sensitivity reports, clinical practice guidelines, AHS formulary guidelines or restrictions, or clinical status of the patient. Inter- and intra-professional relationships were also noted to impact antimicrobial utilization. Other factors that were noted more frequently in Calgary Zone relative to the rest of the province included perception that prescribers were unaware of policies, procedures and/or guidelines, and inconsistent application of formulary policies between sites and zones.

The influence of PPO/ordersets/SCM were identified more frequently in other areas of the province relative to Calgary Zone.

Theme 3: Focus group participants identified multiple barriers that prevent optimal antimicrobial stewardship practices from occurring.

| Frequently Reported Barriers | Calgary Zone | | All Sites | |
|--|---------------|----------------|----------------|----------------|
| | Sites (n = 7) | Total Mentions | Sites (n = 24) | Total Mentions |
| Theme: Barriers identified that affect adherence to formulary policies or application of stewardship principles, which leads to suboptimal antimicrobial utilization | 4 (57.1%) | 7 (58.3%) | 9 (37.5%) | 12 |
| Sub-theme: Inconsistent or unclear expectations affects pharmacists outcomes or ability to apply antimicrobial stewardship processes | 4 (57.1%) | 7 (26.9%) | 11 (45.8%) | 26 |
| Sub-theme: Incomplete patient information available in the dispensary to make informed decisions | 4 (57.1%) | 11 (26.2%) | 17 (70.8%) | 42 |
| Sub-theme: Lack of pharmacist coverage affects ability to apply formulary policies and/or provide antimicrobial stewardship processes | 4 (57.1%) | 10 (23.8%) | 16 (66.7%) | 42 |

Focus group participants identified many barriers (35 unique codes) to implementing or carrying out antimicrobial stewardship processes in their practices. The sub-theme groupings of Policy/Procedure barriers were the most numerous mentioned sub-themes in the Calgary Zone.

Lack of pharmacist coverage as a barrier to implementing antimicrobial stewardship processes was mentioned, although this was mentioned as a barrier more frequently in other areas of the province relative to Calgary Zone. The only other barrier identified at more than 50% of sites was incomplete information being available at the time of order entry.

Theme 4: A team approach is essential to the creation of an effective antimicrobial stewardship program.

| Frequently Reported Recommendations | Calgary Zone | | All Sites | |
|---|---------------|----------------|----------------|----------------|
| | Sites (n = 7) | Total Mentions | Sites (n = 24) | Total Mentions |
| Proactive, multidisciplinary teams could include ID experts, clinical practice leaders, physicians, medical microbiologists, and other healthcare professionals | 5 (71.4%) | 10 (35.7%) | 15 (62.5%) | 28 |
| Physician involvement and buy-in is required for successful implementation of any program | 4 (57.1%) | 7 (21.9%) | 17 (70.8%) | 32 |
| Physician advocates are required to improve antimicrobial utilization | 4 (57.1%) | 5 (55.6%) | 8 (33.3%) | 9 |

For this theme, Calgary Zone FG participants responses were very similar in occurrence and total mentions to the provincial rates. Having proactive multidisciplinary teams that included access to infectious disease specialists (identified as either physician or pharmacist), medical microbiologists, clinical practice leaders, and other health care professionals made up a significant portion of data in this theme. Prescriber (i.e. physician) involvement and buy in to either antimicrobial stewardship processes and/or formulary policies was also identified by FG participants as an essential component to improve antimicrobial utilization.

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

| Frequently Reported Recommendations | Calgary Zone | | All Sites | |
|---|---------------|----------------|----------------|----------------|
| | Sites (n = 7) | Total Mentions | Sites (n = 24) | Total Mentions |
| Theme: Increase physician and staff knowledge and understanding of formulary policies/guidelines and antimicrobial stewardship policies | 4 (57.1%) | 9 (30%) | 15 (62.5%) | 30 |
| Sub-theme: Pharmacists should be offered evidence-based education on a regular basis | 4 (57.1%) | 5 (45.5%) | 9 (37.5%) | 11 |
| Sub-theme: Physicians should be offered evidence-based education on a regular basis | 3 (42.9%) | 6 (33.3%) | 13 (54.2%) | 18 |
| Sub-theme: Nurses should be offered evidence-based education on a regular basis | 3 (42.9%) | 3 (27.3%) | 8 (33.3%) | 11 |

There is a general topic assigned to each of education needs for physicians, pharmacists and nurses. The need for additional education for pharmacists was identified more often in the Calgary Zone, whereas the need for additional education for physicians and nurses was identified more often outside of Calgary. These codes excluded statements that were included in more specific topics.

Education regarding formulary policies and antimicrobial stewardship processes was identified the most often. Also, the desired structure of future educational efforts was identified by participants, and included recommendations that education be timely, evidence-based, and flexible for the target audience's educational needs and practice.

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

| Frequently Reported Recommendations | Calgary Zone | | All Sites | |
|---|---------------|----------------|---------------|----------------|
| | Sites (n = 7) | Total Mentions | Site (n = 24) | Total Mentions |
| Therapeutic interchanges and restrictions need to be logical and easy to follow in order to properly enforce them | 4 (57.1%) | 4 (40%) | 9 (37.5%) | 10 |
| Staff pharmacists need to feel comfortable with the rationale when making recommendations | 4 (57.1%) | 4 (40%) | 8 (33.3%) | 10 |
| Formulary communication (newsletters, updates) are not communicated effectively. Should be concise and easy to read with clear take home messages | 3 (42.9%) | 3 (30%) | 8 (33.3%) | 10 |

Three topics that FG participants identified involved improving formulary policy communication. Ultimately, FG participants mentioned that staff needs to feel comfortable and confident with the rationale for these policies to adhere to them. Building comfort and confidence starts with making communication of those policies effective and clear for not only pharmacists, but prescribers and nursing as well.

Theme 7: Antimicrobial utilization concerns were identified by focus group participants.

| Frequently Reported Concerns | Calgary Zone | | All Sites | |
|--|---------------|----------------|----------------|----------------|
| | Sites (n = 7) | Total Mentions | Sites (n = 24) | Total Mentions |
| Overuse of piperacillin-tazobactam | 6 (85.7%) | 8 (42.1%) | 13 (54.2%) | 19 |
| Inappropriate use of carbapenems | 4 (57.1%) | 4 (21.1%) | 13 (54.2%) | 19 |
| Inappropriate vancomycin use or TDM concerns | 3 (42.9%) | 4 (19.0%) | 13 (54.2%) | 21 |

Six of seven sites within Calgary Zone identified overuse of piperacillin-tazobactam as a concern, and this was greater than other zones. Other concerns in Calgary Zone were inappropriate use of carbapenems, and concerns regarding the appropriate use and/or therapeutic drug monitoring of vancomycin.

Theme 8: Focus Group Participants suggested ideas in the areas of human resources, education, policies, resources and reporting as enablers for a successful antimicrobial stewardship program.

| Frequently Reported Recommendations | Calgary Zone | | All Sites | |
|--|---------------|----------------|----------------|----------------|
| | Sites (n = 7) | Total Mentions | Sites (n = 24) | Total Mentions |
| Updated guidelines accessible to all health care professionals | 5 (71.4%) | 6 (40%) | 13 (54.2%) | 15 |
| Technology required to enable optimal clinical decisions | 4 (57.1%) | 7 (36.8%) | 12 (50%) | 19 |
| Resources that are user friendly and supportive of frontline staff needs | 3 (42.9%) | 4 (33.3%) | 9 (37.5%) | 12 |
| Clinical decision making tools/prompts available | 3 (42.9%) | 7 (70%) | 6 (25%) | 10 |

Focus group participants identified 36 ideas or principles that would be desirable in any future antimicrobial stewardship program. For the Calgary Zone FG's, the top four recommendations related to increased accessibility of up to date information, along with the technology needed to support this access.

Discussion

Pharmacists and pharmacy leadership from the Calgary Zone were well represented in this project, and contributed significantly to the results.

A number of limitations must be noted when considering the results of this study. First, the results are only generalizable to those that attended the focus groups. In addition, the results may be subject to respondent bias; that is, those with strong opinions regarding antimicrobial stewardship may have been more likely to attend the focus groups compared to someone without strong opinions. Lastly, there were some sections of recordings that were untranscribable due to people talking over one another, for example. The number of untranscribable sections were limited, however, and we do not believe this missing information would have an impact on the overall conclusions of the study.

There are opportunities to tailor future formulary policy and antimicrobial stewardship efforts for Calgary Zone based upon differences identified. Potential recommendations include improving communication of AHS formulary guidelines and policies to frontline staff, and in particular, to prescribers, and including details on the rationale for these decisions with supporting references in the communication. Also, education was identified by a number of sites in Calgary, and potential projects to improve education of frontline pharmacy and allied health staff could include development of short podcasts on common ID topics, and development of a universal, easily accessible repository for ID references for all frontline staff to access. Lastly, a number of antimicrobial concerns were identified within Calgary Zone, including overuse of piperacillin-tazobactam, carbapenems, and vancomycin, along with inappropriate vancomycin TDM. These concerns warrant further exploration through utilization and evaluation of indication to identify whether inappropriate use truly exists, and if so, to quantify the level of inappropriate use.

References

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Appendix A - Semi-structured Interview Guide

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| <p>Question #1: What antimicrobial stewardship processes (or tools or initiatives or policies) are you aware of?</p> |
| <p>Question #2: What methods do you currently use to guide appropriate antimicrobial use for your patients?</p> |
| <p>Question #3: As discussed in question 1, formulary policies (e.g. therapeutic interchanges, restrictions, forms) are a component of antimicrobial stewardship within AHS.</p> <ul style="list-style-type: none">• 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? |
| <p>Question #4: Antimicrobial stewardship resources (e.g. Bugs & Drugs, formulary guidelines, etc.) are promoted to help frontline staff encourage the appropriate use of antimicrobials.</p> <ul style="list-style-type: none">• Are these use/applied in your practice/site/program?• What are the benefits of the resources?• What barriers are there to using these resources? |
| <p>Question #5: Do you have concerns about antimicrobial use at your site?</p> <ul style="list-style-type: none">• If NO – move to question 6.• If YES – ask interviewees: What are your concerns? |
| <p>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.</p> <ul style="list-style-type: none">• If NO – move to question 8.• If YES – ask interviewees:<ul style="list-style-type: none">○ Which medications?○ Why do you feel this happens? |
| <p>Question #7: Looking specifically at the formulary guidelines, are they used to make patient care decisions at your site?</p> <ul style="list-style-type: none">• If NO – move to question 8.• If YES – ask interviewees:<ul style="list-style-type: none">○ Can you tell me how they are used to make patient care decisions?○ Are there aspects of the formulary guideline process that you feel are beneficial? Why or why not? |
| <p>Question #8: If you were designing an antimicrobial stewardship program where you work,</p> |

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.

Appendix B - All Themes and Topics

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).

| <u>References</u> | <u>Resources/Procedures</u> |
|---|---|
| "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) RE Guidelines (VREG) RSA Guidelines (MRSAG) Clinical Practice Guidelines (CPG) SA (IDSA) TI (UTI) "Towards Optimized Practice" CPGs (TOP) Febrile Neutropenia Guidelines (FNG) Primary literature/Literature Searches (PL) | <div style="text-align: center;"><u>Local</u></div> 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) <div style="text-align: center;"><u>Provincial</u></div> Former Health Region Policy (FHRP) AHS Formulary (AF) HS 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) |
| <div style="text-align: center;"><u>Professional Resources</u></div> Clinical Practice Leaders (CPL) Infectious Disease consults (IC) Infectious Disease pharmacists (IP) Medical Microbiologist (MM) DUE Pharmacist (DUEP) Drug/antimicrobial Stewardship Pharmacist (DSP) CSHP - PSN (CSHP) | <div style="text-align: center;"><u>Miscellaneous</u></div> Clinical expectations for pharmacists (CEP) Clinical acumen/patient assessment skills (ACU) Antimicrobial Stewardship Committee (ASC) Ad hoc committees (AHC) Saferhealthcarenow surgical prophylaxis initiative (SHN) Antimicrobial Stewardship Program (ASP) Medication Postings (MP) |

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| Drug Stewardship Initiative Orientation (DSIO) | |
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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.

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| <p style="text-align: center;"><u>Patient Specific Circumstances</u></p> <p>Broad spectrum (empiric) antimicrobial therapy continues despite indication to narrow or streamline therapy. This is driven by (I1.0):</p> <ul style="list-style-type: none"> prescribers' values (I1.1) opinion leaders/specialists ability to impact prescribing (I1.2) perception that " the patient is getting better" (I1.3) sufficient patient follow up (I1.4) fear of litigation (I1.5) the ability to easily administer parenteral antimicrobials while admitted to hospital (I1.6) culture and Sensitivity not routinely ordered (I3.7) Prescriber preference supersedes evidence (I2.3) Prescribers lack of confidence in capabilities/diagnosis results in inappropriate prescribing of antimicrobials (I2.5) Broad spectrum antibiotics are being prescribed to facilitate shorter length of stay (I3.3) | <p style="text-align: center;"><u>Professional Dynamics (I2.0)</u></p> <p>Medical residents learn from attending physician's antimicrobial prescribing practices (I2.1)</p> <p>Incomplete or delayed physician to physician communication delays antimicrobial therapy decisions or leads to suboptimal antimicrobial use (I2.4)</p> <p>Lack of team work within programs leads to suboptimal antimicrobial prescribing (I2.6)</p> <p>Nursing requests influence antimicrobial utilization at times where it may not be appropriate (e.g. UTI) (I3.4)</p> <p>Incomplete medical history/charting prevents clinicians ability to make antimicrobial stewardship decisions (I3.6)</p> <p>When professions choose different antimicrobial references, it causes confusion and/or increased workload when applying formulary policy and/or antimicrobial stewardship principles (I3.7)</p> |
| <p style="text-align: center;"><u>Clinical expectations (I2.2)</u></p> <p>Clinical pharmacist identified as resource for antimicrobial therapy, TDM, dose changes (I3.1)</p> <p>Ongoing therapy reassessment (I2.2.3)</p> <p>Enforcement of formulary policies (I2.2.1)</p> | <p style="text-align: center;"><u>Health System Influences</u></p> <p>Policies and Procedures: (I4.0)</p> <p>Antimicrobial restrictions (forms or procedure) are perceived as an annoyance or delay therapy, rather than decision making tool. (I4.1)</p> <p>Order Sets/PPO/SCM guide appropriate antimicrobial choice (I4.2)</p> <p>Frontline pharmacists are not able to focus on</p> |

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| | <p>antimicrobial stewardship due to multiple other initiatives (e.g. MedRec, VTE, etc.) taking priority (I4.3)</p> <p>Prescribers unaware of policies/procedures, guidelines (I4.4)</p> <p>Inconsistent application of formulary policies between sites/zones influence antimicrobial utilization (I4.5)</p> <p>Medication availability:</p> <p>Medication shortages influence prescribing of antimicrobials (I5.1)</p> <p>Physical space restrictions or distance prevent all medications being available (I5.3)</p> <p>Lab:</p> <p>Lack of awareness of laboratory procedures affects antimicrobial choice (I3.5)</p> <p>Culture and sensitivity reports may not include or correspond with formulary guidelines/restrictions (I6.1)</p> <p>Limited availability or delay in reporting of lab test or drug levels impact antimicrobial prescribing (B3.12)</p> |
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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.

| | |
|--|---|
| <p><u>Formulary and Coverage Barriers (B1.0)</u></p> <p>Differences between AHDBL and AHS formulary (including special authorization, formulary listing) increases workload (B1.1)</p> <p>Confusion between prior regional formulary and provincial formulary (B1.3)</p> <p>Discrepancies between formulary and antimicrobial references/guidelines (e.g. “Bugs & Drugs”) exist (B1.4)</p> | <p><u>Barriers associated with formulary policy adherence or application of antimicrobial stewardship principles (B2.0)</u></p> <p>Resource related:</p> <p>The list of Therapeutic Interchanges and Formulary Restrictions/Criteria are too lengthy to remember/enforce (B2.1)</p> <p>Formulary policy communication is not considered effective for frontline staff (C3.2)</p> <p>Alert (“pop-up”) fatigue results in non-adherence with formulary policies (B2.2)</p> <p>Workload associated:</p> <p>Formulary policies and antimicrobial stewardship processes may not be applied at times of high volume or workload. (B2.11)</p> <p>When formulary policies/processes are inconsistently applied, inappropriate utilization</p> |
|--|---|

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|--|---|
| | <p>of antimicrobials occurs. (B2.6) Incomplete or 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)</p> |
| <p style="text-align: center;"><u>Resource gaps (B3.0)</u></p> <p>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) Resources 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)</p> | <p style="text-align: center;"><u>Staff perceptions and attitudes (B4.0)</u></p> <p>Pharmacists do not want to 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 based 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)</p> |

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, multidisciplinary teams could include "ID experts", clinical practice leaders, physicians, medical microbiologists, and other healthcare professionals. (TA3.0)
 - Supporting topics:
 - Infectious Disease 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 Disease 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 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 work 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 on 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 fluroquinolones (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:

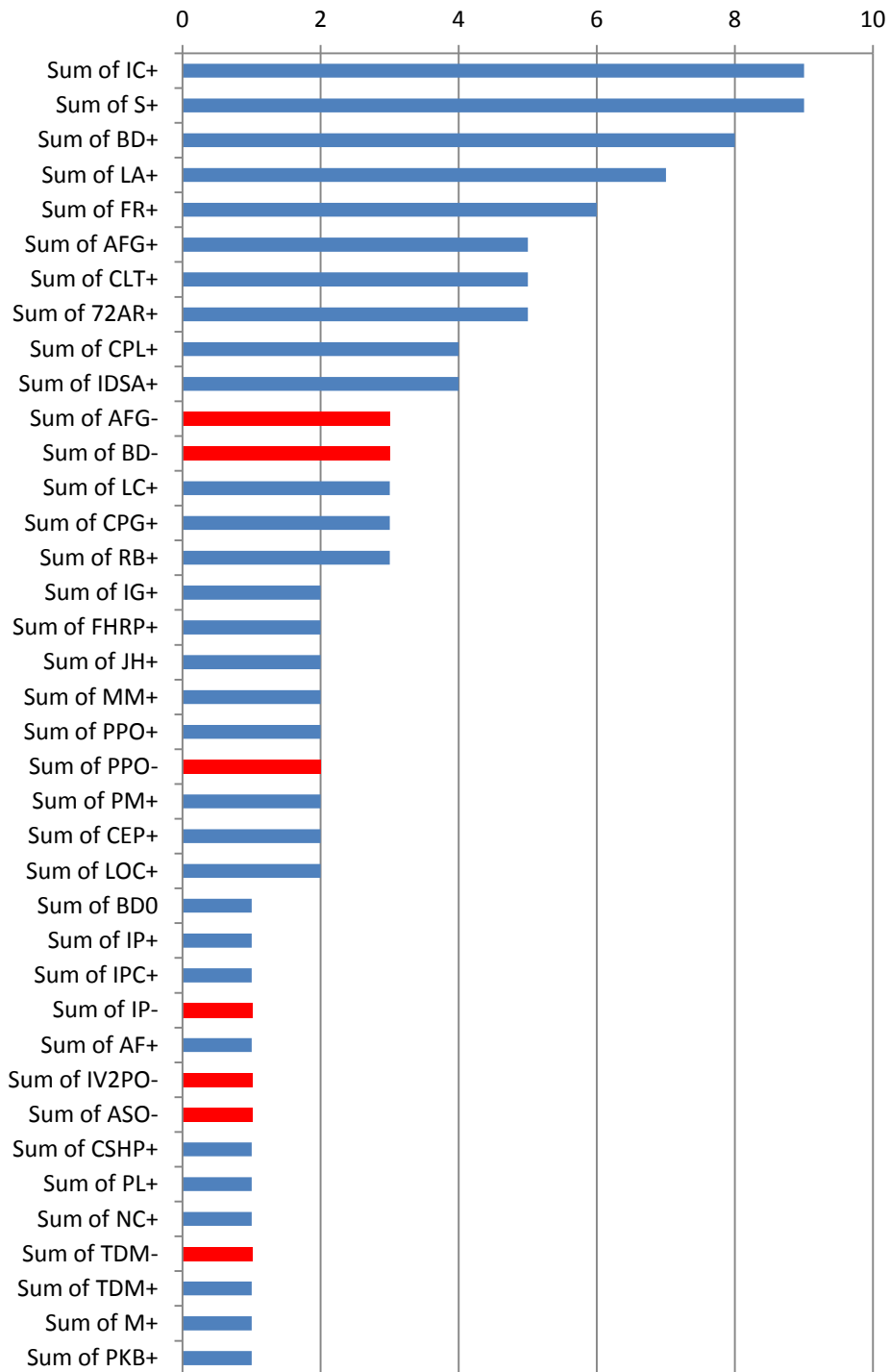
Coding of topics in this theme was directly extracted from transcripts. Little interpretation was done by the reviewers to include data into topics (conventional method).

| | |
|---|--|
| <p>Staffing or program specific recommendations:</p> <p>Majority of admissions come through ER-target proactive interventions here (ENS1)</p> <p>An antimicrobial stewardship process or pharmacist, with a clearly defined role and responsibilities to address antimicrobial stewardship issues (ENS2)</p> <p>Future initiatives require dedicated leadership and timelines, clear communication to staff, and measurable outcomes (ENS3)</p> <p>Increased clinical pharmacist time and/or coverage (ENS4)</p> <p>Engagement of staff and Drug Stewardship Program coming to pharmacists creating buy-in (ENS6)</p> <p>Facility affiliated medical microbiologist added to team (ENS9)</p> <p>Recruited certified Infectious Disease specialist - medical (ENS10), pharmacist (ENS8)</p> <p>Use of Clinical Pharmacy Support Technicians (ENS13)</p> <p>Clinical Practice Leaders to engage in antimicrobial stewardship, regardless of specialty (TA3.2)</p> <p>ATC formulary required (ENP2)</p> <p>Antimicrobial stewardship has to take cost and patient outcomes into account (ENP1)</p> | <p>Policies:</p> <p>Universal protocol to take swabs or culture prior to starting antimicrobial therapy (ENP3)</p> <p>Structured antimicrobial therapy guides: step-down - IV/PO or spectrum narrowing, kidney function dose adjustments, etc. (ENP4)</p> <p>Infectious Disease Pre-printed orders or pathways (ENP5)</p> <p>Alignment of restrictions/availability with DBL (ENP6)</p> <p>Escalation policy or guide to resolve conflicts (ENP7)</p> <p>Including duration of therapy and indication with antimicrobial orders (ENP8)</p> <p>Policy to restrict location of restricted antimicrobials (i.e. not in wardstock) (ENP9)</p> <p>All pharmacists to obtain and utilize APA (ENS15)</p> |
| <p>Resources:</p> <p>Updated guidelines accessible to all health care providers (ENR1)</p> | <p>Reporting:</p> <p>Accurate and consistent utilization data is required to make intervention decisions</p> |

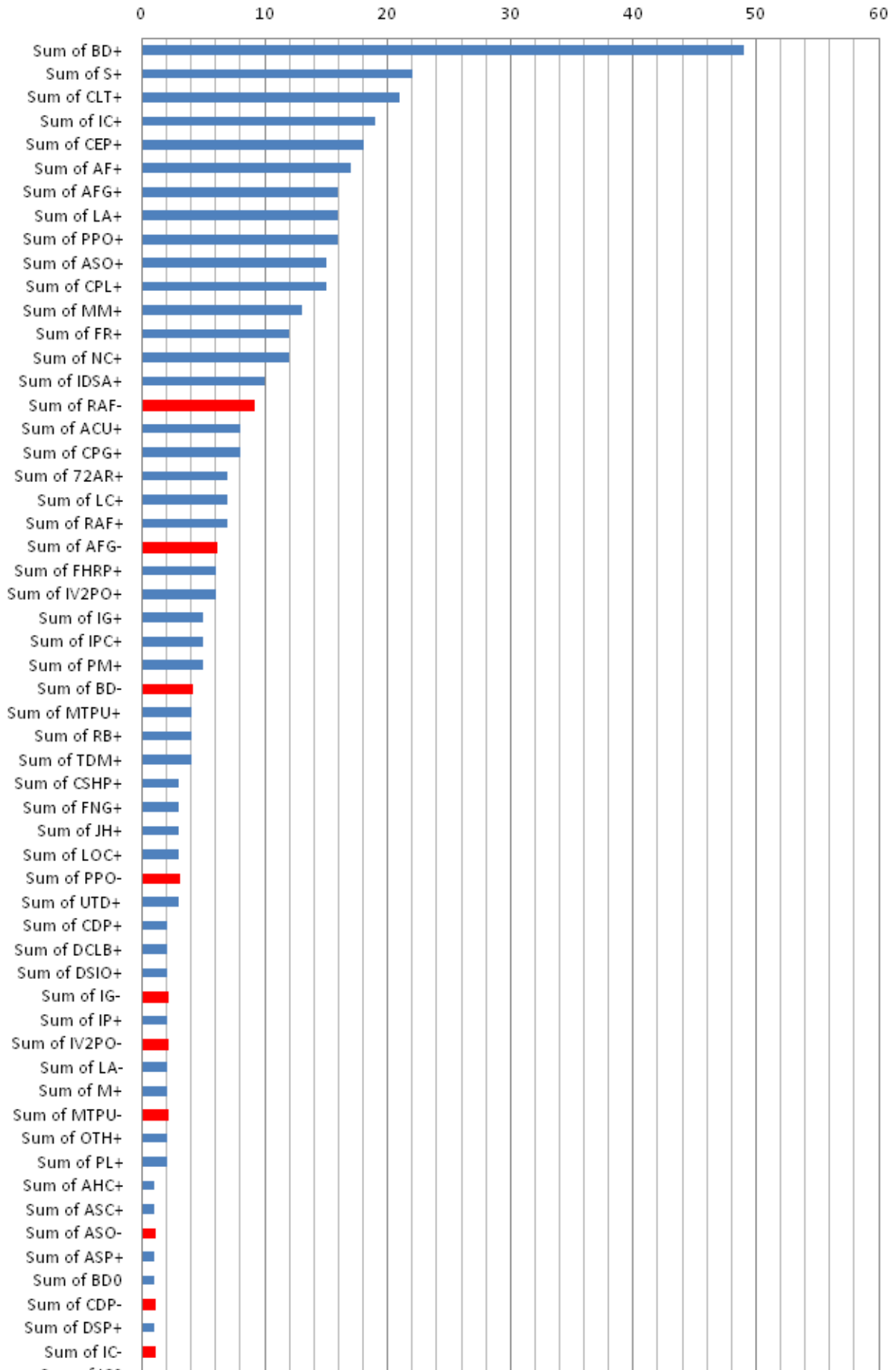
| | |
|---|--|
| <p>Standardized references - follow one resource i.e. Bugs & Drugs or Sanfords (ENR2) Current Antibiogram (ENR3) Resources (e.g. Pharmacy web site, antimicrobial stewardship tools) that are user friendly and supportive of front line staff needs (ENR4) Academic detailing service (ENR5) 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)</p> | <p>(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)</p> |
|---|--|

Appendix C - Frequency Graphs: Calgary and Provincial

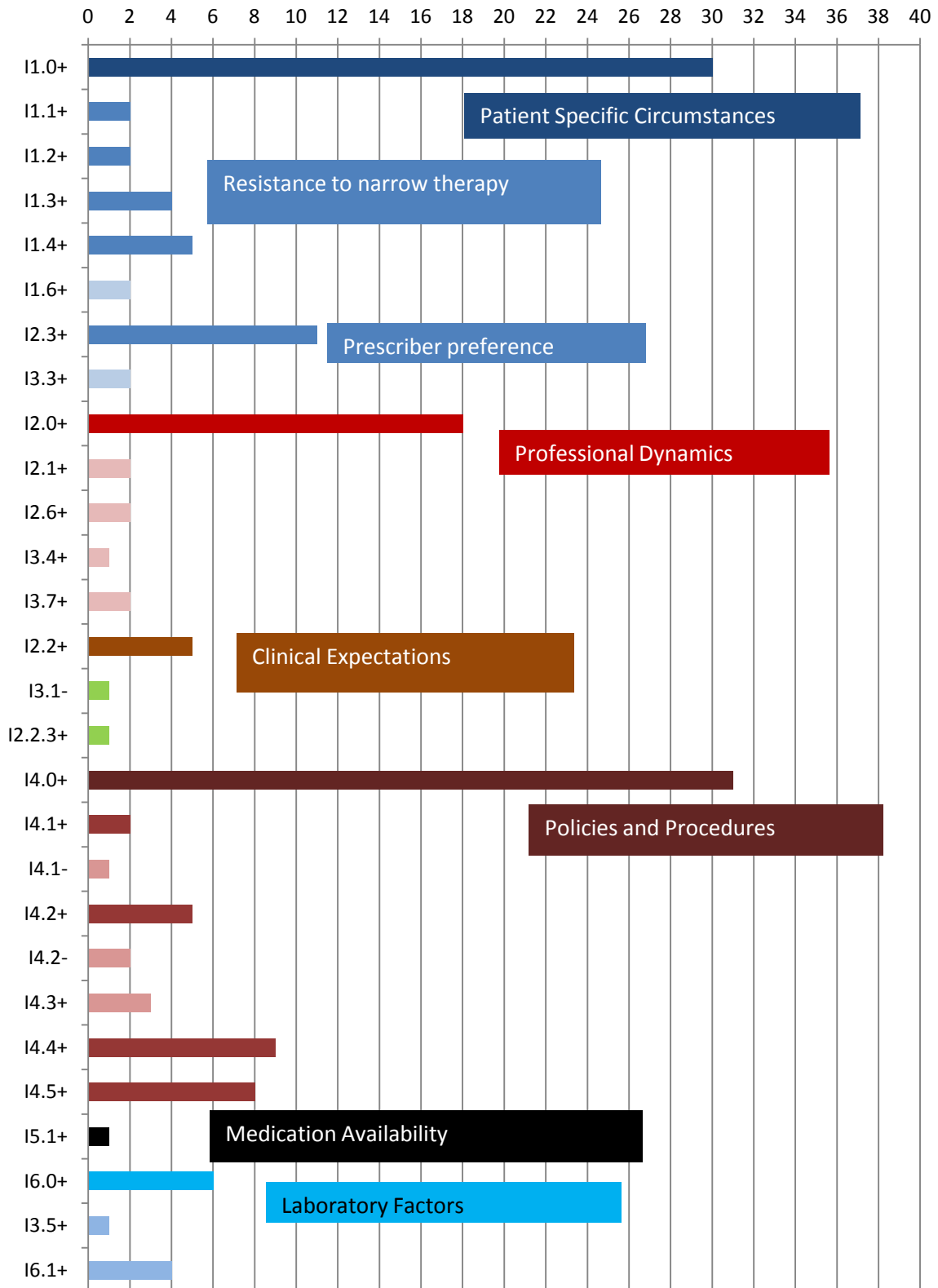
Theme 1 - Resources - Total - Calgary



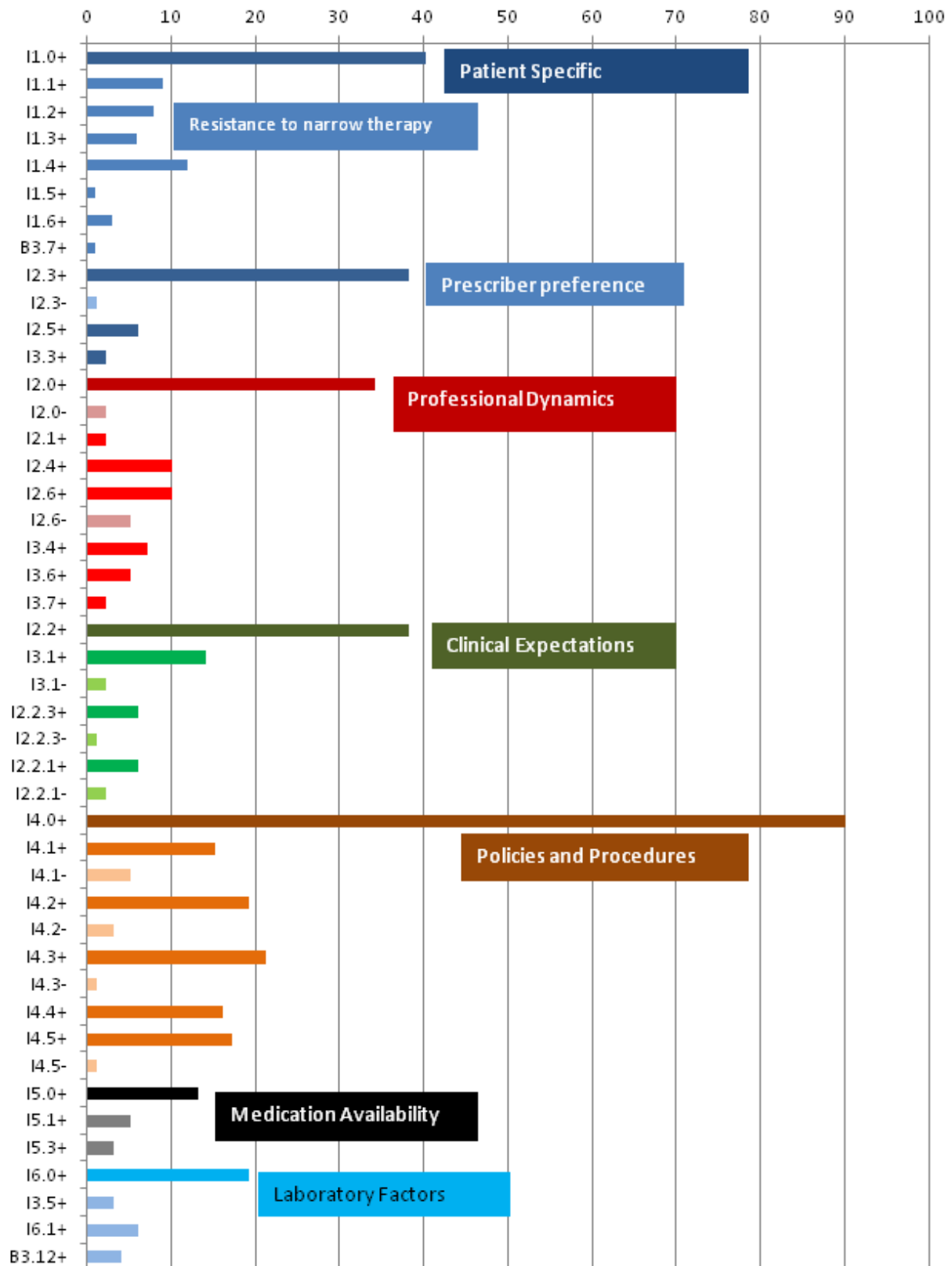
Theme 1 - Awareness of Resources/Tool - Total - All



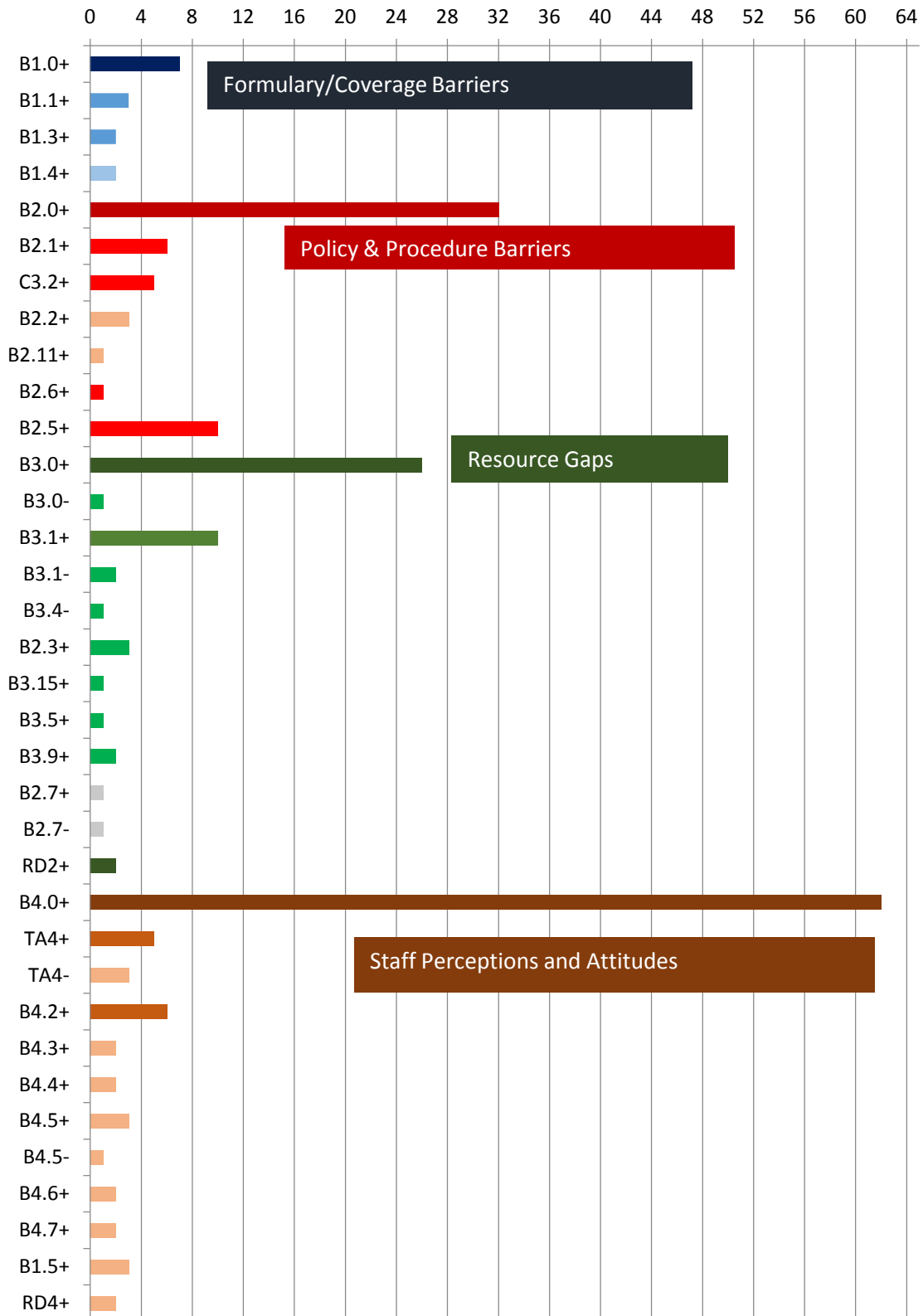
Theme #2 - Influences - Total - Calgary



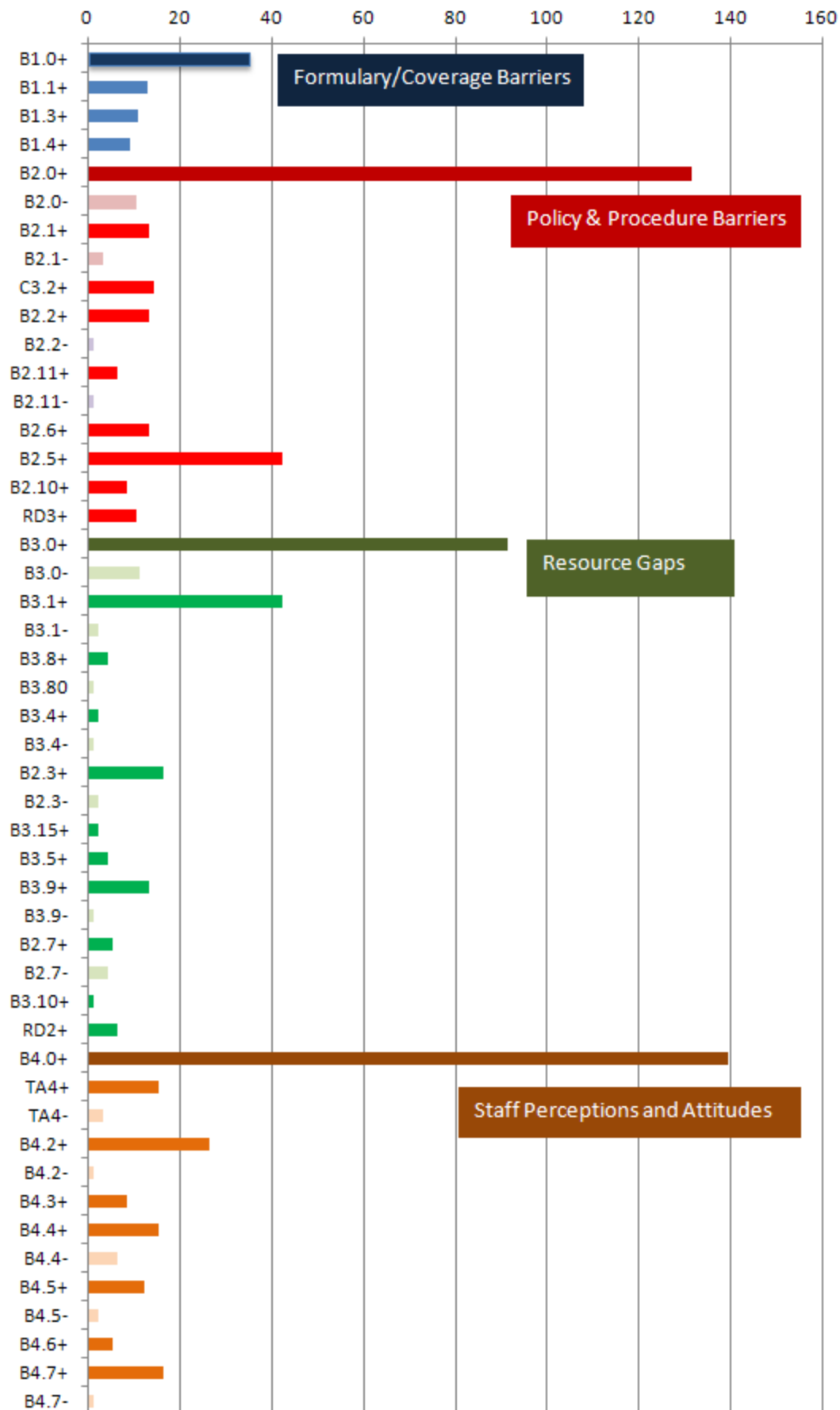
Theme #2 - Influences - Total - All



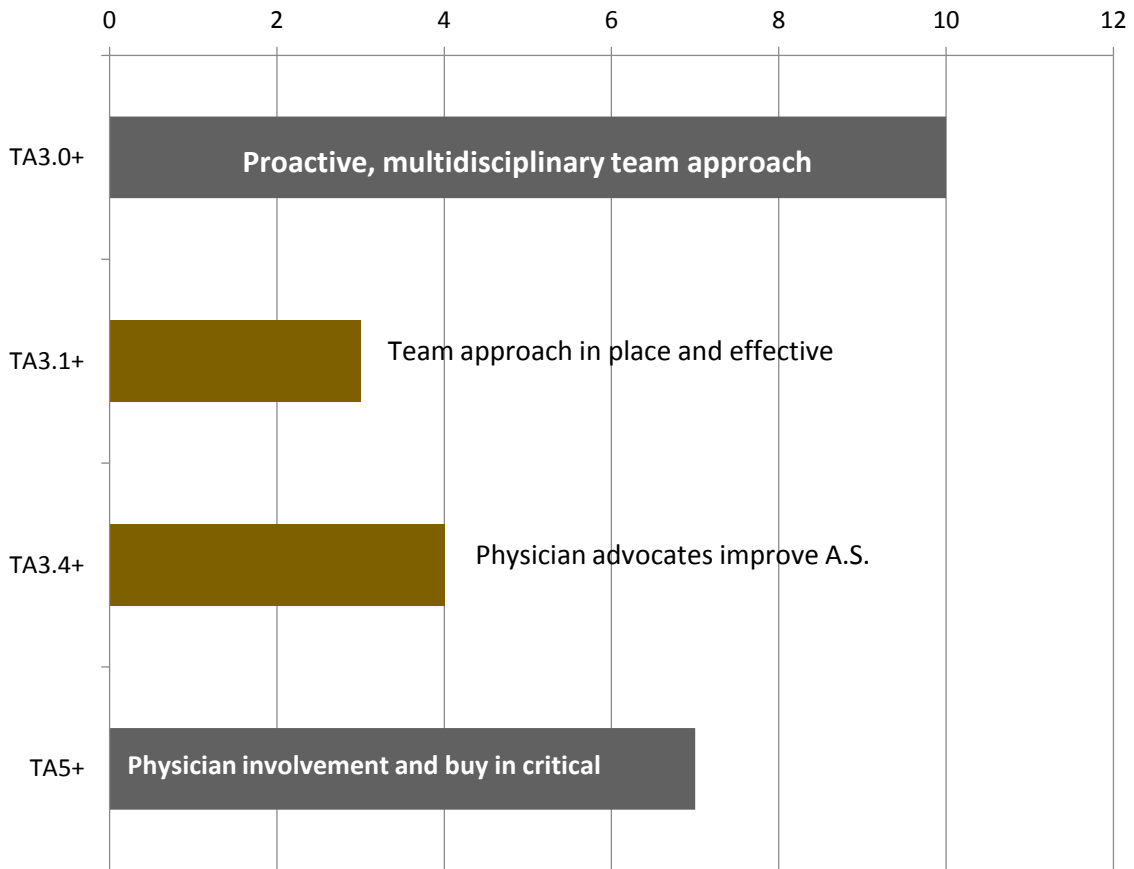
Theme #3 - Barriers - Total - Calgary



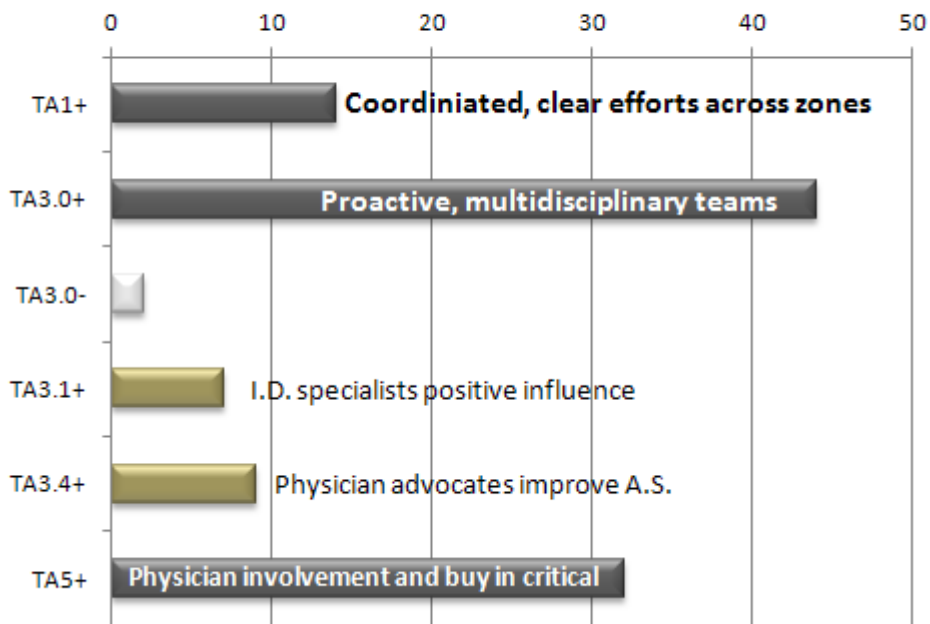
Theme #3 - Barriers to Antimicrobial Stewardship - Total - All



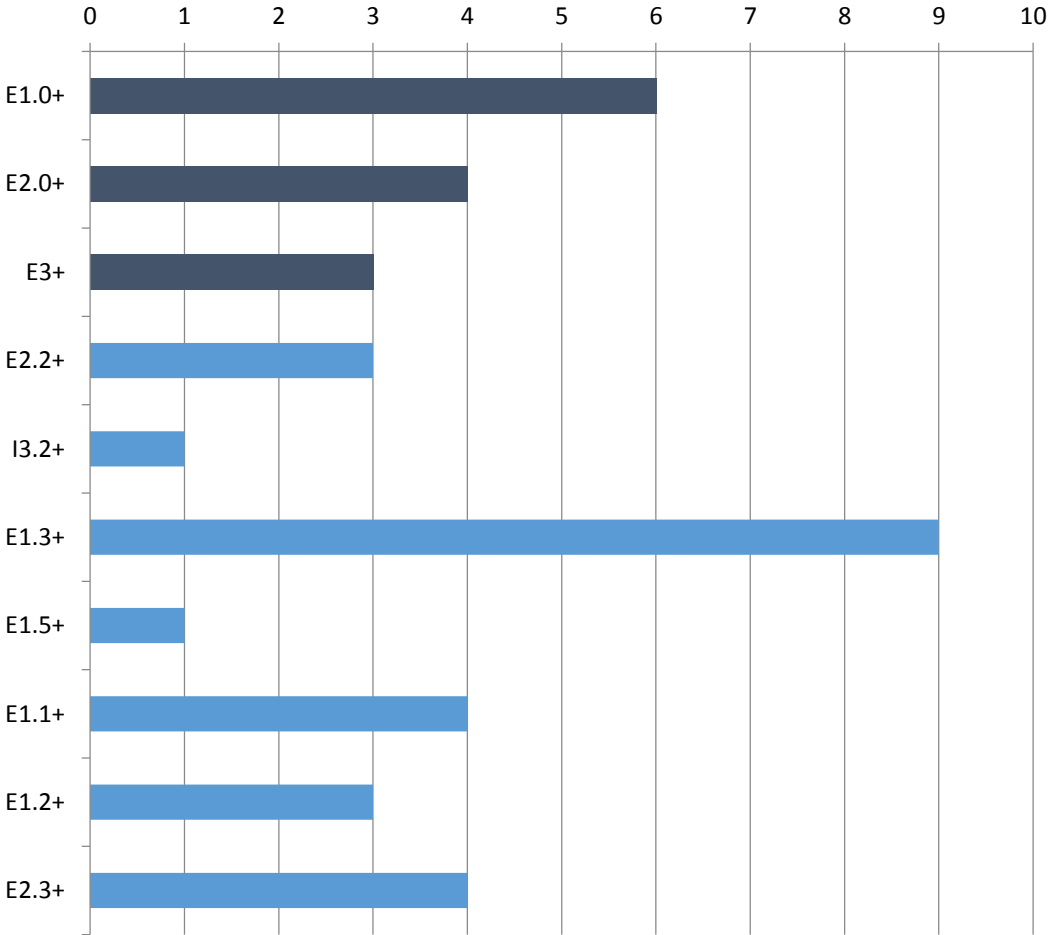
Theme #4 - Team Approach - Total - Calgary



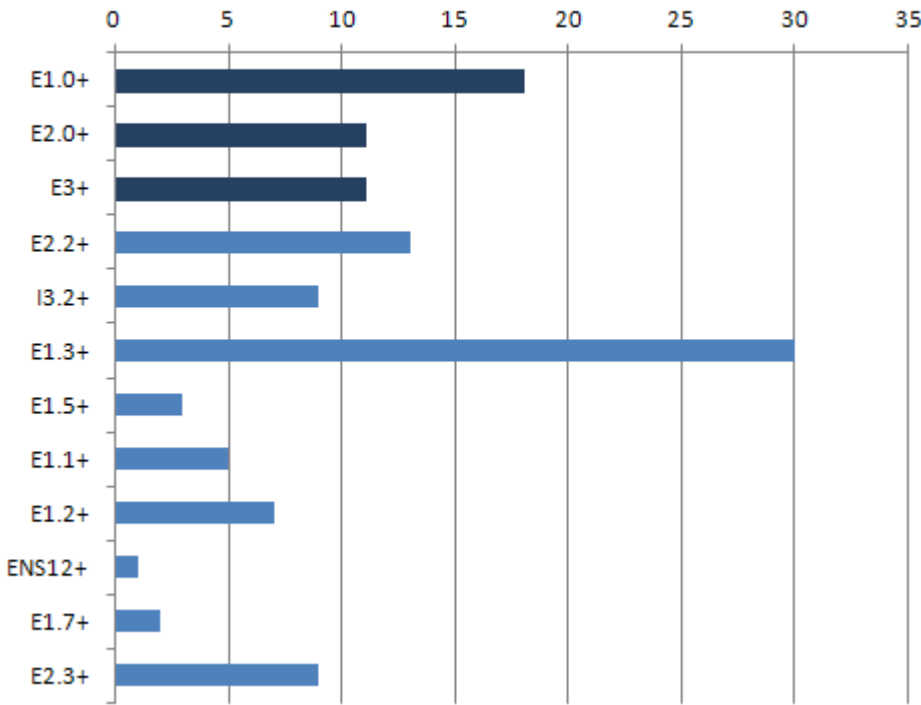
Theme #4 - Team Approach - Total - All



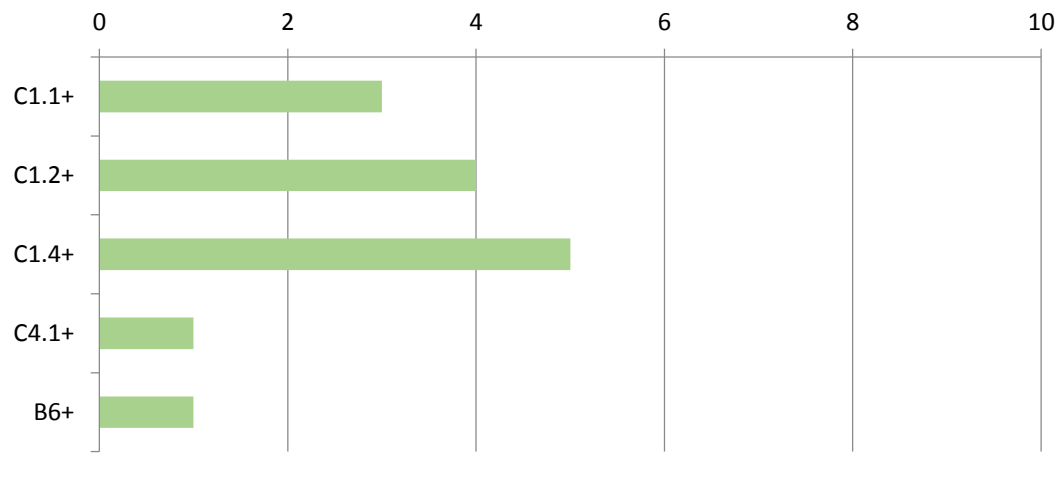
Theme # 5 - Education - Total - Calgary



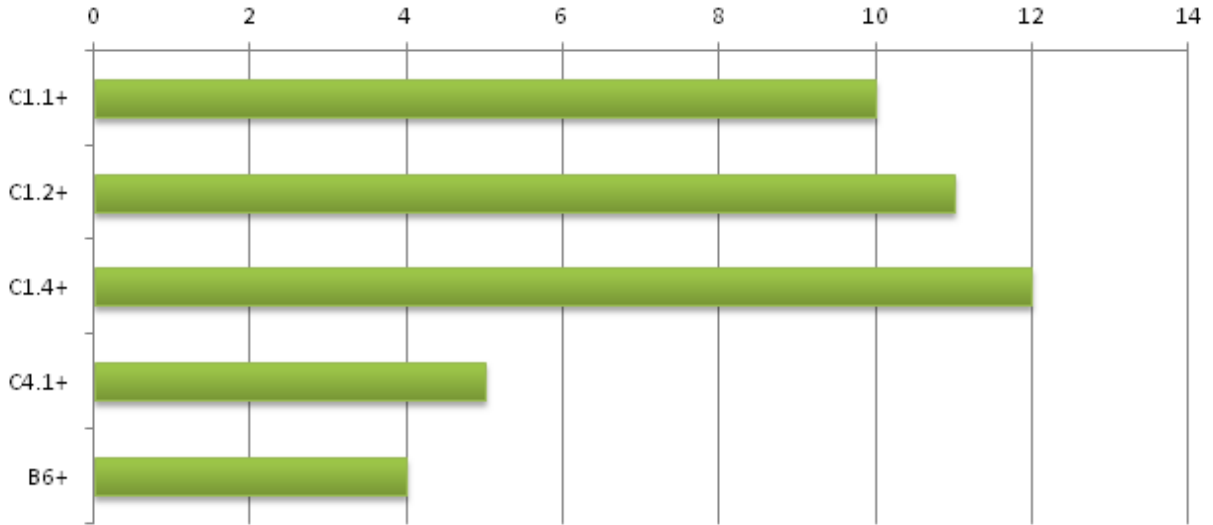
Theme #5 - Education - Total - All



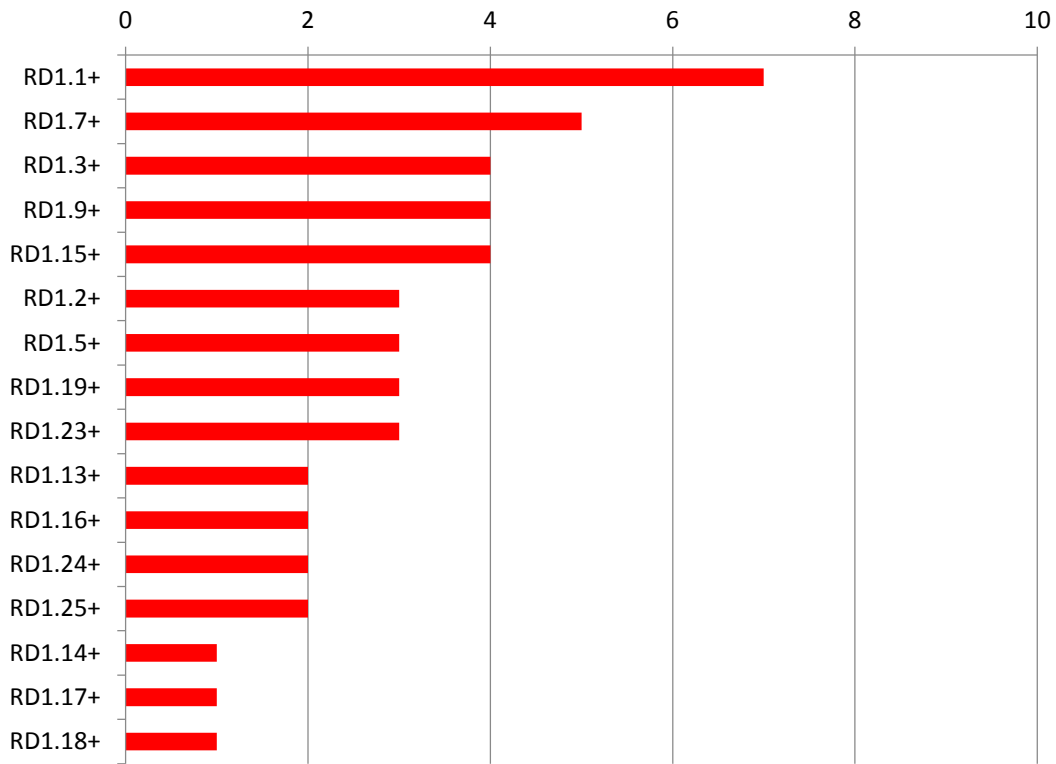
Theme #6 - Communication - Total - Calgary



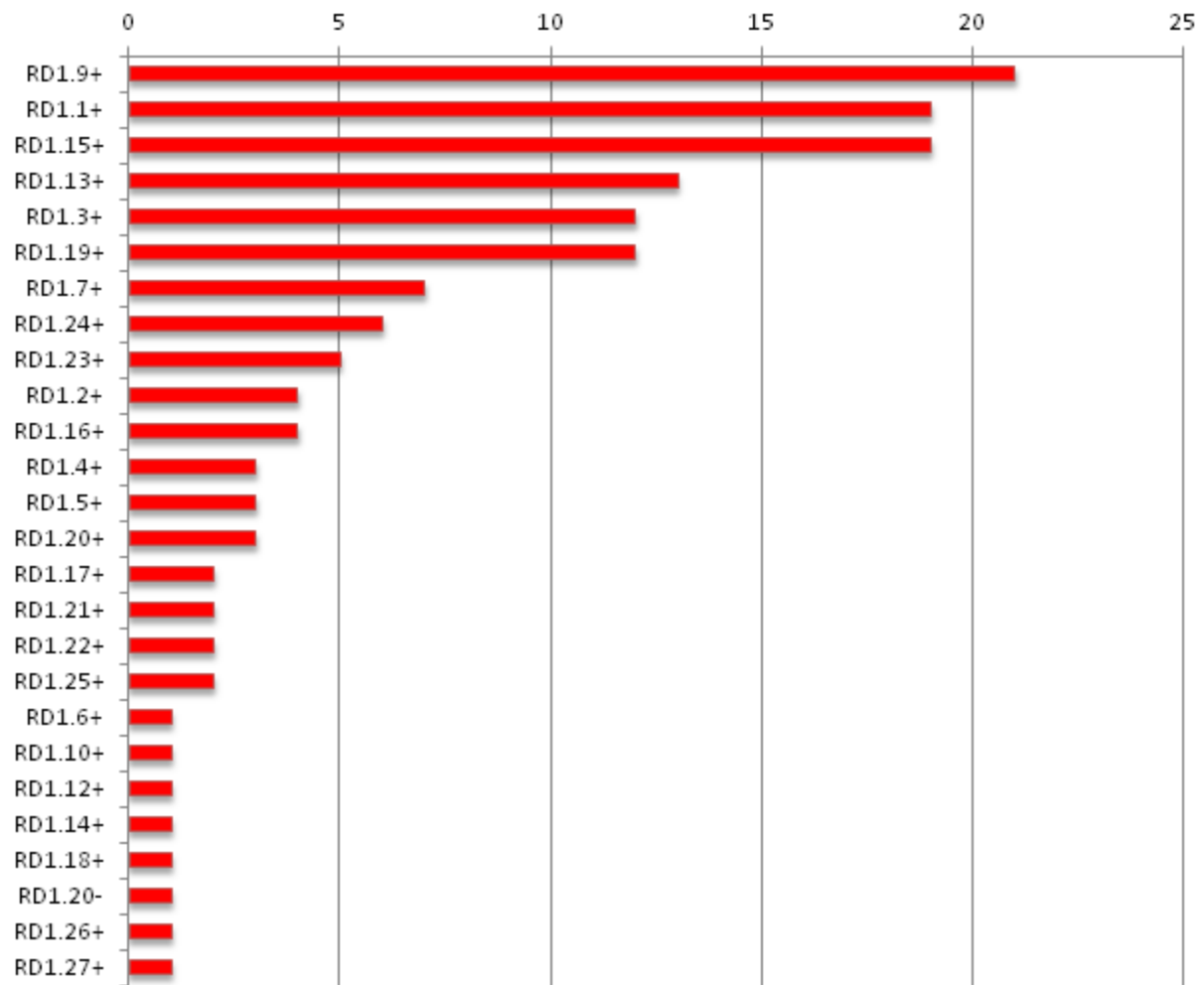
Theme #6 - Communication - Total - All



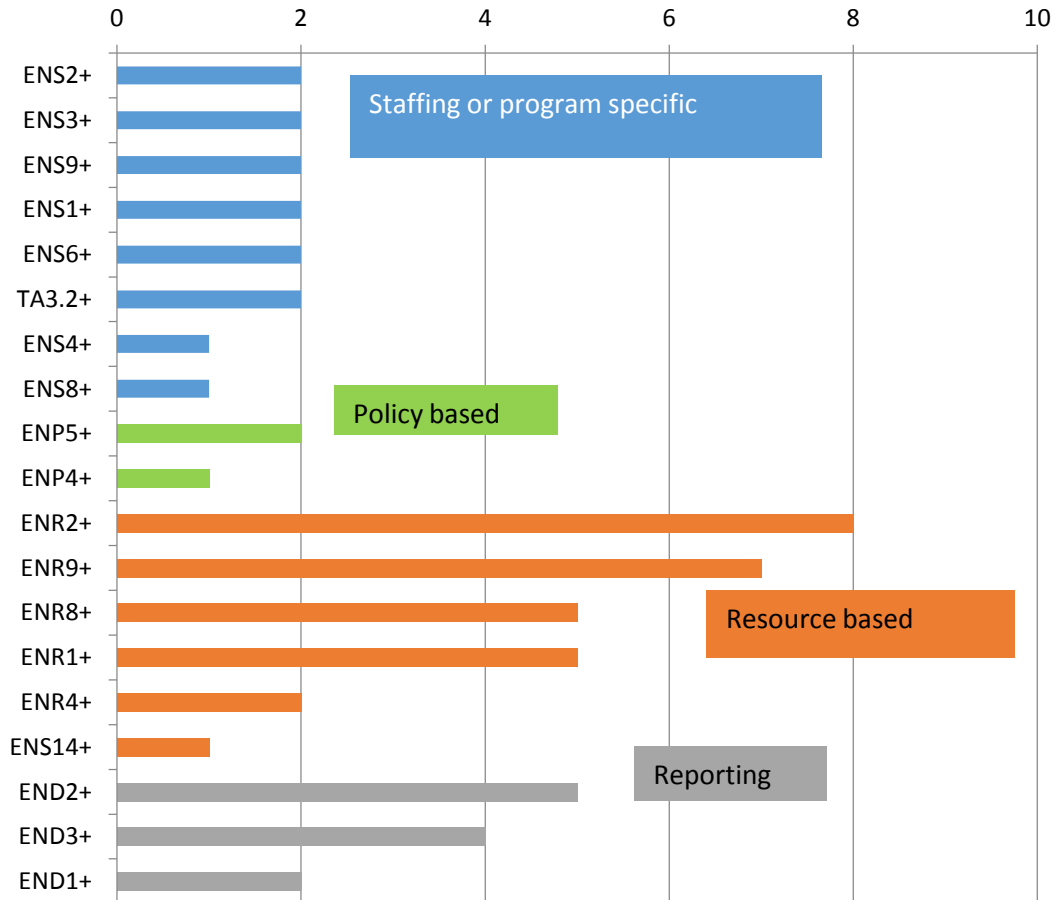
Theme #7 - Antimicrobial Utilization Concerns - Total - Calgary



Theme #7 - Antimicrobial Utilization Concerns - Total -All



Theme #8 - Future Enablers - Total - Calgary



Theme #8 - Future Enablers - Total - All

