Principles and Practice of Antimicrobial Stewardship Program Resource Allocation

George E. Nelson, MD[a],[*],
Navaneeth Narayanan, PharmD, MPH, BCIDP[b],
Sharon Onguti, MD, MPH[a], Kim Stanley, MPH[c],[1],
Jason G. Newland, MD, MEd[d], Sarah B. Doernberg, MD, MAS[e]

KEY POINTS

- Antimicrobial stewardship programs (ASP) improve patient outcomes, safety, and quality and offer significant benefits to their respective health care organizations.
- Despite broad support from national societies, health care quality and regulatory organizations, and robust evidence and examples of demonstrated impact, many ASP face resource and staffing challenges.
- ASP staffing proposals must leverage existing evidence and institution specific priorities and consider specific negotiation techniques to be successful.
- Varying recommendations for ASP resource allocation exist though optimal program composition and staffing depending on many site-specific factors.
- ASP resource and staffing benchmarks must be developed to facilitate ASP implementation.

VIGNETTE

You are the ASP medical director at a small community hospital. The hospital is in discussions with a health system about merging. The C-suite at your hospital asks you to

[a] Department of Medicine, Division of Infectious Diseases, Vanderbilt University Medical Center, 1161 21st Avenue South, A2200 MCN, Nashville, TN 37232-2582, USA; [b] Department of Pharmacy Practice and Administration, Rutgers University Ernest Mario School of Pharmacy, 160 Frelinghuysen Road, Piscataway, NJ 08854, USA; [c] Department of Quality and Patient Safety, Division of Hospital Epidemiology and Infection Prevention, University of San Francisco, California, San Francisco, CA, USA; [d] Department of Pediatrics, Division of Infectious Diseases, Washington University School of Medicine, 660 South Euclid Avenue, St Louis, MO 63110, USA; [e] Department of Medicine, Division of Infectious Diseases, University of San Francisco, California, 513 Parnassus Avenue, Box 0654, San Francisco, CA 94143, USA
[1] Present address: 8000 Marina Boulevard, Ste 600-800, 600, Brisbane, CA 94005.
* Corresponding author.
E-mail address: george.nelson@vumc.org

id.theclinics.com

propose resources that you will need to continue the program under the new merger. How do you determine how best to staff your program given the changing landscape?

WHAT FRAMEWORK SHOULD BE USED TO DETERMINE RESOURCES? WHAT CAN WE LEARN FROM OTHER INDUSTRIES?

The need to define the required resources to accomplish a stated goal is not unique to ASPs or even health care in general. Many other industries struggle with similar questions of how best to determine the number and schedule of staff to deliver a product or service.[1,2] For example, airlines need to plan ground crew, flight personnel, and maintenance staff for year-round operations while forecasting variations in demand, weather, and other factors that may impact scheduling. Call centers may have times of the day where demands are higher or lower and need to account for these fluctuating needs. On the other hand, manufacturing companies may be able to operate with predictable shift schedules that typically prove more straightforward to manage. Numerous other variables may impact workforce planning, such as worker turnover, employee schedule preferences, and changing workloads over time. An important initial step in planning staffing resources is to determine the overall objectives, which may include optimizing quality/performance metrics, efficiency, employee or patient satisfaction, or cost. Often, multiple objectives will be important, some may contradict each other, and stakeholders likely will have differing priorities from among the objectives.[1–3] **Table 1** lists a general framework for considerations that organizations should incorporate into personnel planning. Many industries turn to mathematical models that incorporate forecasts of demand based on historical trends as well as specific objectives and constraints to plan number and schedule of staff.[2] While the particulars of the models are beyond the scope of this review, the concepts underlying them are instructive and applicable to ASP resource planning.

HOW SHOULD THESE GENERAL CONCEPTS FOR STAFFING MODELS BE APPLIED TO STEWARDSHIP PROGRAMS?

Table 1 includes specific considerations for ASPs. Several specific challenges for ASPs stand out in planning staffing.

- Need for individuals with distinct skillsets and training, including physician(s), pharmacist(s), data analysts, and project managers
- Many tasks are time-sensitive and inflexible while others may be more flexible
- Variation in the volume of work can occur based on season and workforce experience
- Often, ASP leaders have competing demands that may be distributed unevenly, such as weeks of inpatient service time for physicians or time spent staffing pharmacy shifts for pharmacists

While lessons from other industries can help to inform antimicrobial stewardship (AS) staffing decisions, fields within medicine that have researched and published staffing models may be the most instructive. In the Infection Prevention literature, recommendations for infection preventionist staffing have been based upon surveys, expert opinions, needs assessments, and surveillance data. Recommendations, mainly focused on the inpatient setting, have ranged from 0.4 to 1.5 infection preventionists/100 beds with more recent estimates tending toward the top of this range, reflecting increasing complexity of care, attention to patient safety and quality, and regulatory requirements.[4–7] In the field of nursing, there is more robust evidence associating lower nurse ratios on worse clinical outcomes directly and supporting regulations and

Table 1
General framework for planning staffing and implications for Antibiotic Stewardship Programs

Characteristic	Considerations	ASP Implications
Personnel characteristics	Full vs part-time vs contract work Specific skills/training required to complete tasks Need for a particular set of workers or crew to assemble together Need for specific tools or spaces (eg, operating rooms) Schedule preferences Seniority	What percentage of time does each team member need to complete the ASP tasks? What are the other job responsibilities of each team member, and how is this work distributed? For example, MDs often will have weeks assigned to inpatient work that require full attention to clinical care Different training is necessary for team members, including pharmacist and physician leads
Types of demands	Based on tasks that must be completed Flexible demand due to inconsistent needs over time Shift-based demand, such as nurse/bed ratios or maximum time to response	ASPs have aspects of all three demand types. For example,: • Task-based demand: Development of guidelines or educational material • Flexible demand: Responding to calls from clinicians Shift-based demand: Planning for prospective audit and feedback
Shift characteristics	Feasible sequences (eg, cannot work a day shift after a night shift) Required sequences of tasks Fluctuation in demand over time	Sequences less important for stewardship Seasonality of antibiotic prescriptions may impact workload for ASP over time At academic centers, arrival of new learners may be a time of higher demand for an ASP
Constraints	May be hard (required) or soft (suggested) Optimal vs minimal capacity Whether to allow understaffing How to staff for specific skillsets How much flexibility is there for cross-covering (eg, can an ICU pharmacist cover a floor pharmacist's shift)? Is cross-training hierarchical (eg, attending physicians can cover for resident physicians but not the other way around)?	ASPs can often function when understaffed but may not be able to perform all activities or meet performance goals Some tasks (eg, guideline development) can be covered by different team members (eg, MDs vs PharmDs) while others (eg, aminoglycoside dosing recommendations) require specific training

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Table 1 (*continued*)		
Characteristic	**Considerations**	**ASP Implications**
Balance	Equal "after hours" shifts and weekend work Distributed vacation coverage Reasonable time between shifts Maximum number of hours per shift and per week Desire for consecutive days off per week Preferences for schedules, location, team make-up Flexibility of task deadlines Expected ratios between full-time and contracted workers	Are antibiotic restrictions enforced after hours? Some stewardship tasks (eg, responding to clinician questions, reviewing positive blood cultures) are urgent while others (eg, guideline development, metric tracking, education campaigns) allow flexibility in scheduling

legislation that facilitate appropriate staffing, but there are complexities in nursing training and patient acuity that make estimating a particular ratio challenging.[8] Literature on physician staffing is sparser but also suggests that staffing decisions are not straightforward and that multiple factors, such as type of hospital, patient acuity, turnover, and surge status, make an ideal direct provider to patient ratio difficult to determine.[9] Both examples shed light on the gaps in research on how to most effectively staff for optimal outcomes. Ideally, research studies would systematically evaluate different staffing models in a rigorous way similar to how a new medication would be studied, such as using randomization or scrupulous statistical methodologies to observational data. Unfortunately, most of the existing evidence relies upon surveys, which reflect present practices but not necessarily optimal practices, and expert opinion, which may not be able to estimate the true needs accurately. Studies correlating outcomes with staffing levels can offer some information, but these may be confounded by other shared factors that may affect both outcomes and staffing levels.[10,11]

WHAT CONSIDERATIONS SHOULD ANTIMICROBIAL STEWARDSHIP PROGRAMS INCORPORATE WHEN PLANNING RESOURCES OVER TIME?

As ASPs estimate staffing needs, it is likely that resources may vary over time depending on the maturity of the program and the environment and goals of the institution. Attention to where a program is in this cycle may help with planning for future needs. Particularly resource-intensive times are likely to include during the initial start-up phase and key institutional expansions or reorganization. Table 2 demonstrates some fundamental concepts to consider when anticipating expansion opportunities. Additionally, the goals of a program should be evaluated continually. While some ASPs may target the basic core elements for a stewardship program,[12] others may prioritize more advanced interventions, which may require additional resources.

When establishing an ASP, it is recommended to start with a baseline assessment to highlight current gaps.[13–16] This is a crucial step for the strategic development of tailored interventions. Though the overarching principles of AS activities are similar, this process differs for each institution based on their individual characteristics. The initial emphasis should be directed at understanding the specific hospital's needs and establishing relationships with key stakeholders including hospital leadership

Table 2
Key concepts to consider at different timepoints in a program's existence

Time Period	Key Personnel considerations	Capital Investments
Initial program development	• Anticipated to be the most resource-intensive time • Augment time in the initial 2–3 years of a program for core stewardship team to perform needs assessment, develop infrastructure for core interventions, ensure regulatory compliance, and plan for tracking priority metrics	• EHR-based or standalone CDSS to support core stewardship activities, tracking, and regulatory reporting requirements[106] • Microbiology lab tools to assist with stewardship goals (eg, rapid diagnostic panels) • Office space, computers, cellular telephones/pagers, and other resources for core team members
Program established for several years, activities going well	• Need to maintain core activities • Allot time for ongoing updating of guidelines in response to the evidence and ongoing improvement cycles • Anticipate potential for turnover in key staff, plan for succession • Statistical support will augment a program's ability to understand its impact over time	• New technologies to optimize work (eg, programs for area under the curve-based vancomycin dosing, new Microbiology platforms) • Investments to optimize existing tools (eg, CDSS)
Program established for several years, anticipate growth, restructuring, or need to respond to regulatory changes	• Likely to require intensified resources • Augment time for the core stewardship team to plan for growth and restructuring of positions, particularly if entering a system model where multiple standalone programs merge to some extent • Increased time will also be needed to align policies, guidelines, and formularies and to ensure EHR-based orders and data reporting align	• Anticipate needs for information technology (IT) investment if merging across EHR platforms or instances to ensure orders and reporting of results are aligned • Increased reporting requirements necessitate resources to facilitate report development, mapping, and validation

Abbreviations: CDSS, clinical decision support system; EHR, electronic health record; IT, information technology.

prior to pursuing any intervention. ASPs should also consider that ASP activities vary based on the frequency of occurrence, the degree of effort needed for execution, the expertise of the stewardship personnel as well as availability of resources necessary for their successful completion. For example, implementing a protocol for the conversion from intravenous to oral antimicrobial agents is a low-hanging fruit as opposed to the effort required for prospective audit and feedback (PAF) or handshake rounds. Evidence-based practice guidelines for specific clinical syndromes requires more

effort during initial development followed by periods of increased attention when updating or renewing guidance. A program in the early phase of development can prioritize simpler activities and introduce more complex interventions as it matures. **Fig. 1** outlines some common resource examples to consider as an ASP evolves. The design of a successful ASP is predicated upon an accurate comprehension of the specific needs coupled with targeted interventions that encompass the unique features of the institution and its people.

WHAT ARE THE REGULATORY REQUIREMENTS FOR ANTIMICROBIAL STEWARDSHIP PROGRAM STAFFING RESOURCES?

Calls for coordinated AS approach began more than 40 years ago with increasing support from national societies, regulatory and quality entities, public health organizations, and presidential executive orders.[17–29] Despite this, regulations around minimum staffing requirements for ASPs do not exist. Guidelines serve as a consensus on approach but may be seen as a general suggestion rather than an imperative. Regulatory bodies carry more influence but often can be circumvented due to the vagary of language used and be relegated to a checkbox mentality where the bare minimum is the goal. The initial inclusion of ASP requirements in The Joint Commission (TJC) standards in 2017 was a significant step but left significant leeway to interpretation.[30] Only 3.8% of hospitals surveyed under the inaugural ASP requirements were cited for deficiencies which subsequently led to increased rigor of the ASP standards.[31] Regardless of the degree of change prompted by those regulations, their inclusion and later revision has potential for escalating impact similar to the evolution of infection prevention standards culminating with mandated staffing levels.[5] ASPs can leverage the increasingly inclusive regulatory trajectory to provide a roadmap and sense of urgency to respond proactively prior to coming directives or review of hospital performance (ie, "get ahead of the curve").

California, Missouri, and Tennessee all have statewide ASP mandates.[32–35] In 2011, 5 years after California mandated ASPs in acute care hospitals (ACH), only 50% of facilities had complied with only 73% of physicians and 80% of pharmacists receiving any dedicated AS financial support.[36] Subsequent California legislation in 2014 went further, requiring inpatient ASPs to have at least 1 physician or pharmacist leader. Missouri passed a similar legislative directive mandating reporting to National Healthcare Safety Network (NHSN) Antimicrobial Use and resistance module (AUR) though staffing and funding mechanisms were not described. In 2019 Tennessee also mandated NHSN AUR reporting by leveraging the List of Reportable Diseases public health infrastructure. Even if not located in those three states, referencing them in general or any applicable local or statewide initiatives can demonstrate the enlarging regulatory footprint. Department of Health and Human Services Centers for Medicare and Medicaid Services (CMS) will require eligible hospitals to report AUR data as part of the inpatient prospective payment system final rule. The initial timeline was ambitious and has been delayed until 2024, but the lead time required for most hospitals for successful AUR submission presses organizations to invest resources now.[37,38] While AUR submission may be categorized by a hospital within the IT arena, the data and prospect of public availability is a direct reflection on ASP implementation. The annual NHSN hospital safety survey includes questions on ASP organization and operations. The number and detail of these questions increases each year though no benchmarks are given due to the variations in staffing models of surveyed facilities. But the continuous and increasing attention again provide a foundation for an ASP proposal for requirements for staffing levels.

Fig. 1. Example of level of resources estimated for core stewardship activities.
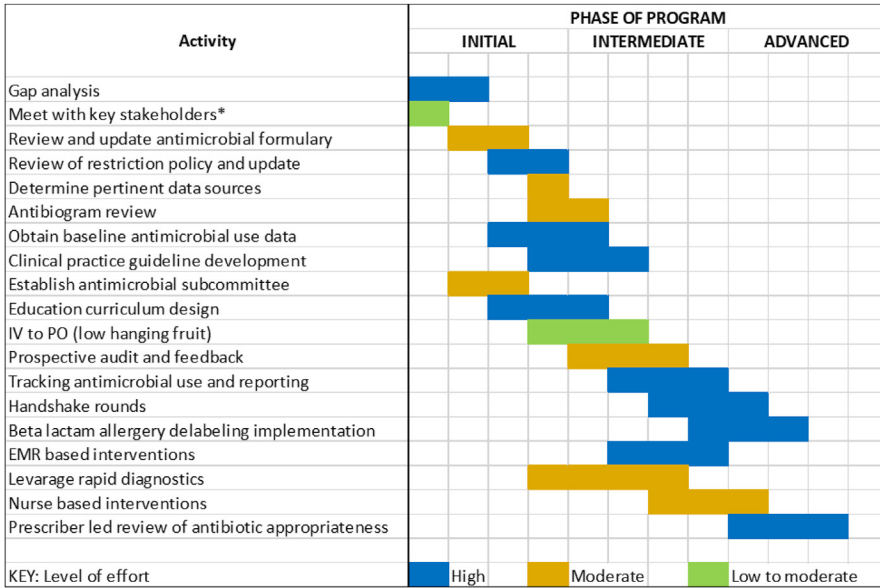
*Includes hospital leadership, clinicians, pharmacists, infection prevention, microbiology, nursing

PERFORMANCE AND QUALITY ENTITIES

Conditions of Participation (CoP) in Medicare includes language to regulate and incentivize ASP development and endorse CMS proposed ASP staffing recommendations, though no minimum staffing regulations exist for ASPs. Inclusion of AS requirements continues to emerge in external performance and quality organizations.[39] The Merit based Incentive Payment System established by the Medicare Access and Children's Health Insurance Program (CHIP) Reauthorization Act of came into effect in 2017 and incentivizes performance in quality, interoperability, process improvement, and cost categories for which ASP can provide value and satisfy requirements.[40] Health care payers (eg, insurers) have inherent interest in improving antibiotic use to reduce costs associated with unnecessary treatment, antibiotic side effects, escalating need for novel, expensive antimicrobials due to resistance, and other outcomes linked to ASP. Many insurers include incentive programs for ASP driven processes.[41] US News and World Report (USNWR) carries significant weight with hospitals due to their annual hospital rankings which are derived from a comprehensive list of measures. USNWR pediatric survey includes minimum ASP staffing thresholds and may signal future inclusion in adult hospital reviews.[20] The Leapfrog group measures hospital safety and included AS elements in their grading up until their recent removal owing to the inability to differentiate hospital performance a similar assessment conclusion to TJC own evaluation of their initial AS standards.[42,43]

WHAT IS THE AVAILABLE EVIDENCE FOR RESOURCING STEWARDSHIP PROGRAMS?

Among other resources (eg, space, IT support, capital), hospitals must allocate resources such that the ASP leaders have protected time to execute these activities. Worldwide, there is a wide variation in time allotted to stewardship activities, trends in health care resources and variability in national mandates.[44,45] **Table 3** lists existing recommendations and literature for staffing ASPs in ACHs. The recommendations, often guided by a list of core activities, are based primarily on expert opinion or survey with only one based on a time-in-motion tracking study.[46] Most of the estimates focus

solely on the inpatient setting and do not account for additional time that may be spent on outpatient stewardship or stewardship at the transition of care (eg, outpatient parenteral antimicrobial therapy [OPAT]). Furthermore, the majority of studies address staffing from the physician and pharmacist perspective but neglect the need for other basic resources, both human capital (eg, project managers, data analysts, microbiologists) and other necessities (eg, technology add-ons, educational handouts). As noted by recent expert groups, ASP minimum staffing standards will be critical for ensuring that ASPs in all arenas are poised to achieve their goals.[5,47]

PharmD FTE

The role and importance of pharmacists within an ASP has been established as core personnel across various organizations including the Centers for Disease Control and Prevention (CDC) and Infectious Diseases Society of America (IDSA). The work by ASP pharmacists spans both inpatient and outpatient sectors.[22,25] Pharmacists serve as ASP leaders along with ID physician colleagues and also execute numerous daily activities and long-term strategic initiatives including, but not limited to, antibiotic preauthorization, PAF, pharmacokinetic dosing services, education for health care staff, development of institutional guidelines, and participation in sub-programs such as antibiotic allergy assessments and rapid microbiological diagnostic reviews and decision support.[48] Additionally, ID-trained pharmacists can provide expert review for patients receiving OPAT.[49] There is a crucial need to accurately estimate pharmacist FTE requirements to optimally establish and maintain a successful ASP.

There is variability in the estimates for ASP pharmacist FTE in the existing literature. Furthermore, the basis for FTE recommendations across the literature range from expert opinion to validated staffing calculations. One of the most impactful organizations to quote a proposed FTE allocation is from CMS.[39] Initially, based on "review of the literature, consultations with CDC, and experience with hospitals," it was estimated to require 0.25 pharmacist FTE for ASP in an average-sized hospital (124 beds translating to 2 FTE/1000 beds). Shortly after they acknowledge the minimum needed FTE may be higher at 1.0 pharmacist FTE/124 beds.[39] These more realistic estimates come from a cross-sectional survey by Doernberg and colleagues.[50] They surveyed US ASPs in order to provide recommendations for ACH. ASP effectiveness, as gauged by survey respondents for their institution, was defined as either cost savings, decreased antibiotic utilization, and/or decreased rate of multidrug-resistant organisms, all within the prior 2 years. Among the useful data from this survey, there are two main takeaways. First, the more FTE support, the better. While controlling for bed size and other covariates, a 0.5 increase in pharmacist FTE was significantly associated with a 58% increased odds of ASP effectiveness. Secondly, as a starting point, the authors provide recommendations for minimal pharmacist FTE support by bed size (100–300 beds: 1.0 FTE; 301–500 beds: 1.2 FTE; 501–1000 beds: 2.0 FTE; >1000 beds: 3.0 FTE). Other expert groups based on consensus-review or surveys have produced similar conclusions – from Canada (3.0 pharmacist FTE per 1000 beds) and France (2.5 pharmacist FTE per 1000 beds).[51,52]

The most direct study to examine the question of ASP staffing needs was done by Echevarria and colleagues of the Tools and Resources Work Group of the Antimicrobial Stewardship Task Force and Pharmacy Benefits Management (PBM) Clinical Pharmacy Practice Office of the Department of Veterans Affairs (VA).[46] They developed and validated an ASP staffing calculator and used it to determine ASP staffing guidance in VA facilities. Both patient care activities (eg, PAF, ASP rounds, de-escalation of broad Gram-negative antibiotics, or OPAT consultation) and ASP management activities (eg,

antibiotic use tracking, committee time, or lectures) were included. Time-in-motion studies were used to assign time values to activities. A total of 12 VA facilities with varying bed size and complexity were included in the validation process. Most percentage of FTE was spent on patient care activities (70%) versus management activities (30%). The final pharmacist (ideally with ID or ASP experience) FTE recommendation to "implement and manage a robust ASP" was 10 FTE per 1000 beds. This recommendation expands upon the ratios previously described but differs as it was specifically designed to calculate staffing needs rather than rely on expert opinions on FTE needs.

Pharmacists serve as central personnel for the successful implementation and continuous management of a comprehensive ASP. While surveys of experts and staffing calculators help provide guidance for FTE needs, it is prudent to acknowledge opportunities to enhance antimicrobial stewardship in key populations (eg, oncology patients) as well as health care settings (eg, OPAT programs).[49,53] Lastly, it is inherently challenging to assess and account for ASP activities that are "decentralized" across pharmacy staff (eg, unit-based pharmacist conducting reviews for appropriate duration of therapy or IV-to-oral antibiotic switches). We believe that the Echevarria FTE recommendation (ie, 1.0 pharmacist FTE per 100 beds) reflects the crucial role of ASP and the complexity of its best practice patient care activities.

PHYSICIAN FTE

Along with pharmacists, physicians play a critical role in the core functioning of ASPs, as recognized by the CDC, TJC, and CMS among others.[14,25,39] Similar to the literature for pharmacist staffing, evidence supporting specific recommendations around physician staffing likewise rely mainly on expert opinion and surveys rather than empirical data.

Historically, specific compensation for physician involvement ASP activities such as antibiotic approvals was limited,[54–57] but with recent regulatory requirements, having dedicated resources to support ASP physicians has become more routine. The initial Medicare CoP mandating hospital ASPs recommended "distinct structure and leadership responsibilities" apart from Infection Prevention.[58] Based on expert opinion and literature review, the initial CoP recommended 0.8 physician FTE/1000 beds while other recommendations have ranged from 0.5 to 3.6/1000 beds (**Table 3**). While most references suggest a linear expansion of FTE as the number of beds increase, Doernberg and colleagues suggested that the relationship may not be linear since resources for some activities (eg, guideline development, antibiogram publishing) may not change linearly with increasing beds while other activities (eg, PAF) would increase in parallel and made the following recommendations about minimal physician FTE staffing by bed size: (100–300 beds: 0.4 FTE; 301–500 beds: 0.4 FTE; 501–1000 beds: 0.6 FTE; >1000 beds: 1.0 FTE).[50] Ten Oever and colleagues recognized the changing needs of a program over time and adapted recommendations according to phase of the program.[59]

Along with their pharmacist counterparts, stewardship physicians play a critical role in ASP leadership. Simultaneously, physician leads often juggle multiple roles in administration, patient care, research, and education. Without dedicated protected time to focus on AS activities, competing demands may dilute the effectiveness of a stewardship program. Accurate estimates of the time needed to co-run ASPs are critical in ensuring that these programs achieve their goals.

ANALYST FTE

If there is not appropriate staffing for analytics teams, physicians and pharmacists assume substantial reporting and analytical workload, drawing time away from other important initiatives. As programs expand in accordance with growing regulatory

Table 3
Staffing recommendations

Reference	Source of data	PharmD FTE	MD FTE	Other
National recommendations (limited to English language)				
2016 Medicare CoP[58]	Literature review, expert opinion	0.25/124 beds	0.10/124 beds	0.05 data analyst support/124 beds
Australian national guidelines[107]	Expert opinion	0.3/100 beds	0.1/100 beds	
European CDC[108]	Literature review, expert opinion	0.5–1.5/250 beds		
Additional sources of recommendations, adult hospitals				
Binda et al,[109] 2020	Cross-sectional survey to a stratified random sample of ASP leads at French hospitals (N = 97) with at least 50 beds	0.18/400 acute care beds	0.19/400 acute care beds	0.09 microbiologist/400 acute care beds Numbers are the reported funding rather than the ideal
de With et al,[110] 2016	Evidence-based guideline from the German Society for Infectious Diseases in collaboration with multiple other societies	0.5/250 beds		
Doernberg et al,[50] 2018	Cross-sectional survey of IDSA, SHEA, and/or PIDS members involved in ASP (N = 244)	1.0/100–300 beds 1.2/301–500 beds 2.0/501–1000 beds 3.0/>1000 beds bed	0.4/100–300 beds 0.4/301–500 beds 0.6/501–1000 beds 1.0/>1000 beds	Independent association between FTE and self-reported program effectiveness 62% of programs lacked adequate financial resources
Echevarria et al,[46] 2017	Validated pharmacist clinical staffing calculator carried out for 1 week at 12 Veterans Health Administration facilities	1.0 (IQR, 1.0–1.47)/100 beds	0.25/100 beds, based on expert opinion of the National Antimicrobial Stewardship Task Force of the Veterans' Health Administration rather than the staffing calculator	

Le Coz et al,[52] 2016	National survey of French ASP leads from 65 facilities to determine estimated time required to fulfill mandated stewardship activities	2.5/1000 beds	3.6/1000 beds	0.6 microbiologist/1000 beds
Morris et al. 2018[51]	Expert opinion and narrative literature review from the Association of Medical Microbiology and Infectious Diseases Canada Working Group	3.0/1000 beds	1.0/1000 beds	0.5/1000 beds for project management support 0.4/1000 beds for data analytical support
ten Oever et al,[59] 2018	Survey to Dutch stewardship teams (N = 14) followed by a consensus meeting to determine resources (time) needed for core activities	Staffing for the entire team: 0.87 to 1.11/300 beds 1.15 to 1.39/750 beds 1.43 to 1.68/1200 beds during the initial phase (with additional 100–135 hours) 1.25 to 1.49/300 beds 2.09 to 2.33/750 beds 2.93 to 3.18/1200 beds in the subsequent phase		Additional 100–135 hours for start-up
Additional sources of recommendations, pediatric hospitals				
McPherson et al,[73] 2018	Survey to pediatric hospital ASPs	1.0 (IQR, 0.5–1)/269 beds (median, range 80–628)	0.3 (IQR, 0.2–0.5)/269 beds (median, range 80–628)	Data analyst, 0.5 (0.2–0.5)/269 beds (median, range 80–628)

Abbreviations: CoP, conditions of participation; IDSA, infectious diseases society of america; IQR, interquartile range; PIDS, pediatric infectious diseases society; SHEA, society for healthcare epidemiology of america.

and reporting mandates,[17–19] analytical support must be included in order to make progress toward target metrics. Timely analytics is critical to all quality improvement initiatives to provide feedback of current state in order to adjust response, otherwise there is potential to lose progress before the modification of the tactics can occur. Both CMS and Morris and colleagues recommend a level of data analytical support at 0.4 FTE/1000 beds.[51,58] While this may be a starting point, further work is needed to understand the right size staffing for data analytics, especially in the current climate of increasing regulatory needs for reporting of metrics and outcomes. With constantly shifting formularies and changes in microbiology testing modalities, species names, and breakpoints, analytics teams must have expertise in the structure of these data and the ability to update reports in real time.

ADDITIONAL RESOURCES

Though less attention has been paid to other resources, Morris and colleagues[51] suggest 0.5 FTE/1000 beds for project management support, a role which would facilitate pharmacists and physicians to be able to work to the top of their licenses rather than managing projects for the ASP. Additional important resources for ASP to access include IT tools to facilitate rational design of antibiotic and microbiology orders, culture and susceptibility reporting, ASP dashboards, and clinical decision support system (CDSS) implementation. These tools are critical to the efficient and effective functioning of ASPs and likely increase the efficiency of the ASP team in being able to perform evidence-based interventions, such as PAF.[60–65] Other resources that ASPs should consider when developing and expanding include having budgets for equipment (eg, computers), space, and materials (eg, pocket cards, prescriber incentives). For programs aiming to disseminate outcomes of strategies and interventions, having access to a statistician can be helpful and should be factored into requests for resources.

WHAT CONSIDERATIONS SHOULD BE TAKEN INTO ACCOUNT IN SPECIFIC SETTINGS?

Historically there has been a predominance of inpatient stewardship largely due to resource allocation. Additional settings to be considered include ambulatory care, emergency departments, urgent cares, day surgery centers, dental clinics, long term care facilities, outpatient dialysis units, specialized hospitals (eg, cancer centers, orthopedic hospitals, rehabilitation hospitals), and health care systems. Though many core stewardship activities are similar, there are notable differences including the patient population, disease states and infrastructure that lead to key differences. In addition, the approach to antimicrobial prescribing is highly variable in the different settings.[38] For example, majority of antimicrobial use in the United States occurs in the outpatient setting and approximately 30% of these prescriptions are deemed unnecessary.[66] This makes it a top priority for AS in the setting of very few established programs.[67] Effective January 1, 2020, The Joint Commission mandated that ambulatory health care organizations that routinely prescribe antimicrobial medications are required to have stewardship programs to maintain accreditation.[68]

   Remote implementation of AS through telemedicine is emerging. It is particularly important in settings where an ID physician or pharmacist is not on site, such is on small and critical access hospitals. This has the benefit of expanding ASP reach in an efficient and cost-effective manner. Different models have been described and range from fully remote to collaborative.[69,70] Additionally, ASPs are ideally suited to assist in emergency response preparedness activities and disaster planning as discussed in an accompanying article in this issue.[71,72]

Resources for inpatient pediatric-based ASPs have been assessed over the past decade. While most of these data come from free-standing children's hospitals, an increase in FTEs for physicians, pharmacists, and data analyst has been identified. In 2017, a group of 52 hospitals with pediatric ASPs completed surveys regarding the CDC inpatient ASP core elements and the amount of FTEs for pharmacists, physicians, and data analysts. Among these hospitals, 79% met all seven core elements. Among the 46 (88%) hospitals that provided FTEs, the median FTEs (interquartile range, IQR) for pharmacists, physicians, and data analysts were 1 (0.5–1), 0.3 (0.2–0.5), and 0.5 (0.2–0.5), respectively, translating into approximately 3.4 FTE/1000 beds, 1 FTE/1000 beds, and 1.7 FTE/1000 beds.[73] Only 18 hospitals provided FTE support for data analyst. An unpublished survey completed in 2023 among 59 pediatric ASPs demonstrated the median FTE for pharmacists is 1 (IQR 0.53–1), physicians is 0.38 (IQR 0.3–0.5) and data analyst is 0.2 (IQR 0.2–0.3) (personal communication). For data analysts, 27 (46%) hospitals are now providing specific financial support. The overall median FTE for all roles in pediatric ASPs has increased to 1.4 (IQR, 0.9–1.85) from 0.75 (IQR 0.45–1.4) according to a survey completed in 2013.[74] It is notable that analytical support is higher amongst the pediatric programs than reported by most adult programs, which may reflect public reporting of pediatric hospital stewardship resources through USNWR.[75] While more financial support has been provided, the increase in stewardship effort the outpatient, urgent care, and telehealth areas will need underscore continued need for increases in support. Furthermore, no specific pediatric data exist on the level of financial support that provides the maximal benefit to antimicrobial use in the inpatient setting.

WHAT ARE THE LIMITATIONS TO CURRENT ESTIMATES OF STEWARDSHIP RESOURCES?

There are multiple limitations to using surveys and reports of existing resources to determine staffing levels, including.

- Frequently, programs report inadequate resources. If resourcing recommendations rely on reports from under-resourced programs, this issue may be perpetuated.[50,76–80]
- Much of the literature on outcomes associated with ASP implementation is based on single-center reports. Health systems are becoming increasingly complex and interrelated with opportunities for economies of scale but also potential for loss of trust and personal connection.
- It is not clear how best to adjust for complexity of underlying patient population in staffing recommendations. A hospital with a complex patient population, such as one serving a transplant or oncology population, may have more intense needs than a community hospital.
- As noted above, settings other than traditional ACHs require more attention and data.
- Most current estimates have not been tied to outcomes, and more research must be done to define the benefits of various ASP staffing and resourcing models.

HOW TO GET BUY-IN/PITCH TO THE C-SUITE FOR NECESSARY RESOURCES

Why do so many individual ASPs face barriers establishing or elevating their respective programs when it comes to obtaining necessary, sufficient, or optimal resources despite robust data and regulatory and guideline support?

Myriad reasons complicate the resource request process including both varying institution-specific obstacles as well as central difficulties shared across all care

settings. In the absence of standardized resource requirements, much of the supporting evidence on ASP value and strategy defaults to a "one-size-does-not-fit-all" approach.[12] This understandable summary perspective consequently leaves individual ASPs to plead their cases alone in endless repetition and in parallel. While fine-tuning an individual approach strengthens the case and is essential, leveraging the shared themes discussed later in discussion can provide a useful roadmap.

WHO IS YOUR AUDIENCE?

The first question that must be asked is, "from whom do I need buy-in?" or stated another way, "who am I pitching?" This would seem to be obvious but represents a critical first step that informs subsequent strategy decisions which is too often ignored.

The C-suite includes the chief hospital leaders or decision makers. Traditionally this includes the Chief Executive Officer (CEO), Chief Medical Officer (CMO), and many other titled positions but can also include various thought leaders or influential people who direct hospital operational decisions.[81,82] The roles and number of individuals who comprise the C-suite can vary by clinical organization and in many cases (eg, smaller hospital settings) a single individual may fulfill more than one role. This can be either advantageous if that person is supportive of ASP or not, if less so. Occasionally the executive team is less clear as can be seen in complex organizations. Understanding the hierarchy of decision making and organizational structure (discussed elsewhere) becomes an important piece to understand who you are trying to influence. Once the target audience has been confirmed, identifying their general overall and specific current goals on which they are focused will inform the direction and examples presented of your pitch (**Box 1**).[81,83–86]

Each C-suite has countless competing priorities so regardless of how impressive your presentation or product (ie, ASP) is, if it doesn't align with their specific targets, your pitch will be deferred.[81,87] Of almost equal importance is what information they respond to as this answer will tell you what data you need to include. Has the C-suite responded traditionally to regulatory pressure, specific critical events, or peer comparisons?[88] Identifying the target audience is finding the lever while insight on drivers that move the needle (eg, if comparisons, to whom?) pushes it. Often, hospitals will explicitly detail their annual goals. External facing material may lack sufficient detail (eg, "improve quality care") while internal data may spell out explicit steps (eg, reduce length of stay by 1%). Reviewing these materials if available is vital, and if inaccessible getting a sense of what they contain from stakeholders still yields benefit.

ANTIMICROBIAL STEWARDSHIP PROGRAMS BASELINE ASSESSMENT

In preparing the pitch, it is essential to show what you have accomplished and what opportunities for return on investment (ROI) exist. Taking stock of your current ASP demonstrates your success to date, your organizational awareness, and sets the stage for your future roadmap. There are a variety of materials that can be employed to perform a gap analysis of your ASP such as SWOT (strength, weakness, opportunity, threat) analysis and related iterations, core elements checklists, and formal gap analysis tools.[12,89–91] (Appendix 1) This method will identify what gaps you are trying to close and what opportunities you are trying to address. Additional project bundle tools can help identify your likelihood of success for a given project and can highlight elements that must be addressed.[92] This framework can be applied to any project (eg, IV to PO conversion) including your resource pitch itself.

Box 1
Examples of Hospital Administration Priorities

Financial
  Develop new revenue streams
  Revenue growth
  Expansion into or acquisition of new location/market
  Cost Containment
  Rising drug and medical supply costs
  Assess value-based models
  Optimize billing
  Cost containment of fixed costs
  Reduce variable costs (supplies, medications, and so forth)
  Optimize bed occupancy
  Reduce length of stay

Operations
  Improving ambulatory access
  Strengthen primary care alignment
  Strengthen specialty care alignment
  Redesign for population health/accountable care organization strategy
  Emphasize innovation
  Reducing health inequities
  Increasing equity, diversity, and inclusion
  Optimize risk adjustments
  Streamline hiring process

Regulatory
  Compliance with regulatory changes
  Inclusion of new payment rules
  Public reporting performance

Clinical
  Minimize clinical variation
  Improve patient outcomes (eg, observed: expected mortality, and so forth)
  Patient satisfaction
  Reduce hospital associated conditions
  Exceed clinical benchmarks (eg, sepsis treatment, bundled care, care pathways)

Provider
  Employee recruitment and retention
  Workforce optimization via sustainable staffing models and workload
  Mental health/burnout
  Employee wellness strategy
  Staffing shortages
  Professional growth (advancement, career development, continuing education)

Information Technology
  Data Security
  Interoperability
  Clinical Communications
  Telehealth
  Artificial Intelligence
  Remote patient monitoring
  Predictive/personalized medicine
  Real time data access
  Modernize outdated technology
  Automate manual processes

HOW TO TALK THE TALK?

Start with a story. This tactic is employed in many forums to engage the audience and psychologically align the listener to the speaker's viewpoint.[93,94] A relatable story personifying your larger pitch can engage the audience and set the stage for ultimate

ask. Emphasizing the quality and improved patient care from ASP resonates with providers more than cost but messaging the C-suite can be more complex and must additionally include metrics to demonstrate value to their bottom line. The pitch must appeal to the C-suite logic and speak their language.[95]

Language must be simple. A presentation of *P*-values and meta-analyses may be expected at an academic conference but will obscure your main point. The C-Suite is concerned with their forest, not the weeds of your presentation. Your pitch will often be short with limited slides. Taking a page from the business world, pitches to potential investors, which incidentally is exactly what you are doing, include a limited number of essential talking points.[96,97] (Appendix 1) You can, and should, have a wealth of back-up slides that can be referenced for details for specific questions. The same approach can be employed for written proposals. An executive summary should outline the main points only and can be accompanied by a more in-depth review if desired. (Appendix 1).

HOW TO DEMONSTRATE VALUE?

Capturing the totality of ASP value has proved elusive but demonstrating their economic value remains essential to receive necessary resources. ASPs inhabit a dual reality engaging with frontline clinical providers where patient care benefits resonate more than cost metrics while simultaneously liaising with leadership for whom compelling ROI data is expected. Attribution of value to ASPs is not straightforward given the countless potential associated confounding factors and complexities of the health care processes they support. Many examples of cost -avoidance and -effectiveness can be leveraged, but precise economic value to a specific institution is less obvious.[98–102] Value often depends on the specific audience such as the relative importance of patient benefits to providers in the example above. ASP value propositions ultimately are subject to the priorities defined by a given facility. Even if an ASP program can provide significant ROI for a specific project, if that project is not seen as a priority issue, the likelihood it will be funded wanes.

SUMMARY AND NEXT STEPS

Despite the literature cited above, many unknowns remain regarding how best to resource and staff ASPs. Rather than relying on surveys and expert opinions, future work should focus on looking at outcomes associated with different program models. As reporting into the NHSN AUR module becomes a regulatory requirement under CMS,[103] there will be opportunity to study associations between ASP resource and staffing levels and program outcomes. Additional studies determining strategies for most efficient use of resources will also be important, particularly as more advanced technologies become reality, and further research is needed in non-inpatient settings.[60,70,104,105]

In this post-pandemic belt-tightening economy in health care, ASPs must continue to generate a convincing case to leadership for resource allocation. Having regulations in place will help to defend resources, and additional robust evidence will further support the importance of these programs.

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CLINICS CARE POINTS

- ASPs should develop a framework assessing both general staffing considerations such as personnel characteristics, types of demands, constraints, and balancing measures as well as institution specific factors including current stage ASP development, healthcare setting, identified gaps, and return on resources invested (ie, "low hanging fruit").

- Successful ASP resource proposals should identify internal advocates and stakeholders involved in the decision making process and frame rationale around institutional priorities. Additional supporting information should draw from applicable regulatory and external performance entities, published literature, and peer comparisons.

- Building an effective proposal is aided by demonstrating recent successes and existing opportunities identified through careful baseline assessments and presented in a simple, straightforward manner concentrating on how additional resources will add value to key institutional focus areas with more detailed information available for review if required.

- Aligning ASP resource allocation with leadership allocation requires individualization based on institution specific factors but can be strengthened by crafting the specific request from general operational tools that have been used by other programs and health settings. Proactive attention to ASP resourcing allows for a more thoughtful, less reactive presentation and raises awareness prior to much needed staffing thresholds and increased external emphasis.

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APPENDIX 1

Form 1: Example of Situation, Background, Assessment Response ASP Resource Summary.

SBAR Name	Antimicrobial Stewardship Program – Pharmacist Program Director FTE Request
SBAR Author	Humble Steward, MD, Quality Champion, MBA, Pharm Dee, Pharm
Date	Not/Soon/Enough
Situation:	

General University Hospital (GUH) Antimicrobial Stewardship Program (ASP) currently has XX dedicated clinical pharmacist specialist full-time equivalent (FTE) to provide comprehensive stewardship, clinical patient care, quality improvement, education, and research services for approximately XXX beds. ASP pharmacist resources are significantly inferior to peer hospitals and suggested pharmacist to patient ratios in published literature. The Centers for Disease Control and Prevention (CDC) recommends appointing a physician and pharmacist

(*continued*)

co-leadership model when implementing an ASP. The lack of adequate pharmacist resources and formally dedicated ASP pharmacist co-director significantly inhibits the program's effectiveness and ability to meet the needs of this rapidly expanding program.

Background:

Antimicrobial Stewardship (AS) performs a critical hospital function. Mounting evidence demonstrates that ASPs can optimize individual patient outcomes, improve the quality of care, and provide critical patient safety processes while reducing antimicrobial-associated adverse events (eg, acute kidney injury and *C. difficile* infection rates), length of stay, and development of drug resistant bacteria all while simultaneously reducing institutional costs. ASPs are often jointly led by expert pharmacy and infectious diseases (ID) personnel. ASPs are a Joint Commission and CMS requirement and are overwhelmingly advocated for by the CDC and ID societies (eg, IDSA, SHEA, PIDS, and many more). Reporting of antimicrobial use (AU) will be mandated by CMS in 2024, and numerous quality organizations such as Leapfrog, USNWR, and so forth and payors (insurance, and so forth) increasingly include ASP metrics and performance in their reviews.

The General Hospital ASP (GASP) is co-led by an ID-trained AS PharmD with XX FTE support, but currently lacks necessary staffing resources. Appendix 1 provides a summary of currently provided services by the clinical pharmacist specialist. There are other ID-focused PharmD roles (outpatient parental antimicrobial therapy [OPAT] and inpatient team-based coverage). These positions provide important supplementary support but are not part of the formal ASP and do not report through this entity given their other, non-AS specified functions and roles.

Antimicrobials are some of the most commonly used treatments (>XX% of GUH inpatients receive antibiotics) and accounted for approximately $XX million in drug spend for the enterprise the past fiscal year. Current ASP focus is on high-risk, high-cost antimicrobials, safety algorithms, regulatory compliance, and optimization of antimicrobial therapy through partnership with clinical teams, divisions, providers.

Last year, ASP led XX safety focused AS projects, XX formulary reviews, and XX activities [describe high level "wins"]. Total cost avoidance was estimated at $XX over the year. All this on top of providing XXX daily interventions to clinical teams and XX therapy reviews.

Despite the tremendous activity and output of ASP, XX% of potential daily AS interventions are not addressed given bandwidth issues (totaling nearly XXX interventions). Additionally, several important process improvement projects are unable to be expanded including team based prospective audit-feedback, compliance with developed clinical pathways, and targeted antibiotic utilization interventions. Only XX% of CDC reportable antibiotics, XX% of institution non-restricted antibiotics, and XX% of institution restricted antibiotics are routinely monitored.

External agencies have identified varying minimum suggested staffing levels which are not currently met given a variety of variables that influence staffing models. Suggested minimum staffing levels include CMS and HHS (0.2 FTE PharmD/100 beds), VA AS Task Force (1.0 FTE/100 beds), and infectious diseases national societies (IDSA, SHEA, PIDS: 0.3/100 beds).

Assessment:

GASP's current pharmacist resources of XX clinical pharmacist specialist FTE are significantly inadequate to sustain the current and growing clinical and administrative program responsibilities. Additional pharmacist resources, specifically XX is needed to continue to meet the needs of this program.

Recommendation:

Approve XX pharmacist FTE to provide additional stewardship and infectious diseases support for GASP.

Form 2. Summary of Antimicrobial Stewardship Clinical Pharmacist Specialist services, recent quality improvement initiatives, cost-savings initiatives, and recent/ongoing research.

Clinical/ Administrative Services	Clinical Practice: • Provides pharmacy leadership, guidance and educational support related to antimicrobial stewardship (AS) practices and initiatives to providers, pharmacists, and staff, as applicable • Rounds consistently with Infectious Diseases (ID) Consult team(s) • Provides support to improve safety and to reduce risk to patients treated with antimicrobials through the creation of protocols and order sets • Provides leadership in the development of guidelines, order forms, safety, treatment, and diagnostic algorithms to improve the care and safety of patients receiving antimicrobials • Provides oversight of cost-effective use of antimicrobials • Represents AS-specific concerns for Information Technology applications • Develops and participates in pharmacy-related research projects and quality improvement initiatives, such as the performance of pharmacy and/or quality-related surveillance of antimicrobial use, within the program • Participates in the provision and education of pharmacists and physicians, pharmacy and medical residents and students (if applicable to your facility) • Coordinates effort to provide timely drug information to providers/staff • Creates national visibility by presenting scholarly materials at educational conferences, professional meetings, and organizations (State/Local, National) • Participates in the response to pertinent laboratory data • Optimizes infectious disease-related CMS Core Measures and TJC requirements related to AS • Maintains knowledge with the current standard of practice for AS via medical literature and conference attendance Administrative Practice: • Provides leadership and oversight of formulary management related to antimicrobials • Monitors and reports AS utilization to all necessary parties • Participates in departmental and hospital committees and initiatives related to AS • Documents clinical activities, consultations, education, and so forth in EMR • Works with peers to achieve division and departmental goals • Models behaviors that exemplify the institution's mission statement • Maintains outstanding skills as a clinical pharmacy practitioner and consistently demonstrates the value of pharmacy services
Recent Process Improvements	• Insert recent successes here • Patient, quality care advancements • Process, efficiency improvements
Recent Cost-Savings Initiatives	• Insert cost-saving initiatives here
ASP Impact/ recognition	• Insert awards, personal achievements, anything that highlights program if available

Supported by

Humble Steward, MD, Director Antimicrobial Stewardship Program, General University Medical Center and Respected Ally, MD, Chief Hospital Visionary,

General University Medical Center * note to typesetter/compositor: The yellow highlighted text should go with form 2 above and ideally be on the same page.

Form 3: Budget Impact and Resources Required.

FTEs Required.

Job Classification	FTE count	Salary at Midpoint	Benefits (XX% of annual salary)	Total Salary Cost
Pharmacist – ASP	XX	$XXX	$XX	$XXX

RETURN ON INVESTMENT

Specific gaps that each additional PharmD ASP FTE support would address is the XX% of daily AS interventions that are not currently addressed with expectation of ∼XXX annual interventions. As well as expanding team coverage from XX to YY%, closing the gap in monitoring of restricted drug monitoring (from XX-YY%), directing 1 to 2 additional MUEs, implementation of ∼X programs (eg, targeted team empiric antimicrobial ordering, team-specific syndromic algorithms [such as asymptomatic bacteriuria], and so forth) and implementing a more robust prospective audit and team AU feedback program. Currently prospective audit and feedback is not done routinely nor comprehensively, though is a recommended leading practice by regulatory bodies of which greater than 80% of ASPs perform via optimal methodologies.

Evidence suggests that there is a 1.5-fold increase in effectiveness (as measured by reduced antibiotic use, direct antimicrobial costs, and reduced antimicrobial resistance) for each additional 1.0FTE. An overwhelming amount of evidence demonstrating ROI, cost savings/avoidance, with minimum ROI for optimal ASP over $1 million for an institution this size and recent reviews conducted internally demonstrate significant opportunities for increased cost savings beyond the impact on patient safety and quality of care.

REFERENCES

1. Insert references.
   Form 4: Example Budget Request Letter to Leadership.
   Budget Request for Increased Antimicrobial Stewardship PharmD FTE.

BACKGROUND

Antimicrobial Stewardship (AS) performs a critical hospital function. Robust evidence demonstrates that ASPs can optimize individual patient outcomes, improve the quality of care, and provide critical patient safety processes while reducing antimicrobial-associated adverse events (eg, acute kidney injury and *C. difficile* infection rates), length of stay, and development of drug resistant bacteria all while simultaneously reducing institutional costs.

Antimicrobial Stewardship Programs (ASP) are jointly led by expert pharmacy and infectious diseases personnel. ASPs are a Joint Commission and CMS requirement and are overwhelming advocated for by the CDC and infectious diseases societies (eg, IDSA, SHEA, PIDS, and many more). Reporting of antimicrobial use (AU) will be required by CMS in 2024, and numerous quality organizations such as Leapfrog, USNWR, and so forth and payors (insurance, and so forth) increasingly include ASP metrics and performance in their reviews.

CURRENT STATUS

The ASP is co-led by an ID-trained AS PharmD with [XX] support. There are other ID-related roles (outpatient parental antimicrobial therapy [OPAT] and inpatient team-

based coverage. These positions provide important supplementary support but are not part of the formal ASP and do not report through this entity given their other, non-AS specified functions and roles.

Antimicrobials are some of the most commonly used treatments (XX % of [insert hospital name] inpatients receive antibiotics) and account for >$XX million direct drug cost last year. Current ASP focus is on high-risk, high-cost antimicrobials, safety algorithms, regulatory compliance, and optimization of antimicrobial therapy through partnership with clinical teams, divisions, providers.

Last year, ASP led XX safety focused AS projects, XX formulary reviews, and XX activities [describe high level "wins"]. Total cost avoidance was estimated at $XX over the year. All this on top of providing XXX daily interventions to clinical teams and XX therapy reviews.

OPPORTUNITIES

Despite the tremendous activity and output of ASP, XX% of potential daily AS interventions are not addressed given bandwidth issues (totally nearly XXX possible interventions). Additionally, several important process improvement projects are unable to be expanded including team based prospective audit-feedback, compliance with developed clinical pathways, and targeted antibiotic utilization interventions. Only XX% of CDC reportable antibiotics, XX% of institution non-restricted antibiotics, and XX% of institution restricted antibiotics are routinely monitored.

External agencies have identified varying minimum suggested staffing levels which are not currently met given variety of variables that influence staffing models. Suggested minimum staffing levels include CMS and HHS (0.2 FTE PharmD/100 beds), VA AS Task Force (1.0 FTE/100 beds), and infectious diseases national societies (IDSA, SHEA, PIDS: 0.3/100 beds).

There are incomplete data from peer hospitals, though many enjoy more robust staffing (~3.0 ASP PharmD/hospital), and all say limitations in personnel are the greatest limiting factor/barrier. Important similar hospitals demonstrate staffing levels at XX FTE.

ANTIMICROBIAL STEWARDSHIP PHARMACY SPECIALIST RESPONSIBILITIES

Clinical Practice:
1. Provides pharmacy leadership, guidance and educational support related to antimicrobial stewardship (AS) practices and initiatives to providers, pharmacists, and staff, as applicable
2. Rounds consistently with Infectious Diseases (ID) Consult team(s)
3. Provides support to improve safety and to reduce risk to patients treated with antimicrobials through the creation of protocols and order sets
4. Provides leadership in the development of guidelines, order forms, safety, treatment, and diagnostic algorithms to improve the care and safety of patients receiving antimicrobials
5. Provides oversight of cost-effective use of antimicrobials
6. Represents AS-specific concerns for Information Technology applications
7. Develops and participates in pharmacy-related research projects and quality improvement initiatives, such as the performance of pharmacy and/or quality-related surveillance of antimicrobial use, within the program
8. Participates in the provision and education of pharmacists, pharmacy and medical students, PGY1 and PGY2 pharmacy residents, and ID physicians
9. Coordinates effort to provide timely drug information to ID Division and other providers/staff

10. Creates national visibility by presenting scholarly materials at educational conferences, professional meetings, and organizations (State/Local, National)
11. Participates in the response to pertinent laboratory data
12. Optimizes infectious disease-related CMS Core Measures and TJC requirements related to AS
13. Maintains knowledge with the current standard of practice for AS via medical literature and conference attendance

Administrative Practice:

14. Provides leadership and oversight of formulary management related to antimicrobials
15. Monitors and reports AS utilization to all necessary parties
16. Participates in departmental and hospital committees and initiatives related to AS
17. Documents clinical activities, consultations, education, and so forth in EMR
18. Works with peers to achieve division and departmental goals
19. Models behaviors that exemplify the institution's mission statement
20. Maintains outstanding skills as a clinical pharmacy practitioner and consistently demonstrates the value of pharmacy services

RETURN ON INVESTMENT

Specific gaps that each additional PharmD ASP FTE support would address is the XX % of daily AS interventions that are not currently addressed with expectation of ∼XXX annual interventions. As well as expanding team coverage from XX to YY%, closing the gap in monitoring of restricted drug monitoring (from XX-YY%), directing 1 to 2 additional MUEs, implementation of ∼X programs (eg, targeted team empiric antimicrobial ordering, team-specific syndromic algorithms [such as asymptomatic bacteriuria], and so forth) and implementing a more robust prospective audit and team AU feedback program. Currently prospective audit and feedback is not done routinely nor comprehensively, though is a recommended leading practice by regulatory bodies of which greater than 80% of ASPs perform via optimal methodologies.

Evidence suggests that there is a 1.5-fold increase in effectiveness (as measured by reduced antibiotic use, direct antimicrobial costs, and reduced antimicrobial resistance) for each additional 1.0FTE. An overwhelming amount of evidence demonstrating ROI, cost savings/avoidance, with minimum ROI for optimal ASP over $1 million for an institution this size and recent reviews conducted internally demonstrate significant opportunities for increased cost savings beyond the impact on patient safety and quality of care.

REQUEST

An additional XX FTE dedicated to inpatient ASP directed initiatives is requested.

Respectfully,

Humble Steward, MD.

Director Antimicrobial Stewardship Program, General University Medical Center.

Fig. 1. Example ASP SWOT Analysis * note to compositor/typesetter: all these figures should appear directly under each other to give the appearance of one figure. Okay to split onto two pages.

Fig. 2: Example ASP Gap Analysis.

Form 5: Example C-Suite Resource Pitch Deck Elements.

Slide	Description	ASP Modification
	Business Focus	ASP focus
1	Introduction	Introduction
	Company name, logo, and tagline	ASP Team Appreciation for invitation
2	Problem Statement	Problem Statement
	Clearly define the problem your product or service solves Highlight the significance and relevance of the problem Illustrative story/picture to capture target	C-Suite Target your proposal will address Consider using a representative story to engage your audience
3	Solution	Solution
	Present how your product/service solves the identified problem, addresses the pain points, and provides value to customers	Outline your ASP target solution

Slide	Description	ASP Modification
	(continued)	
4	Market Opportunity	Organizational ROI
	Describe the size, growth potential, and trends of target market Showcase market demand for your product/service	What identified gap/opportunity will your proposal address?
5	Business Model	Resource Utilization
	Explain your revenue model Discuss pricing strategy, key partnerships, and distribution channels	Describe how you will use resources
6	Competitive Analysis	Influential External Factors
	Identify your main competitors and analyze their strengths and weaknesses Highlight your unique competitive advantage	Peer pressure, regulatory requirements, and so forth How your solution impacts leadership priorities (and thereby the organization's competitive advantage/ROI)
7	Go-to-Market Strategy	Implementation Plan
	Outline your marketing and sales approach Describe your customer acquisition strategy and distribution plan	How will you implement solution? How will you scale with provided resources?
8	Team	Proposed Partners/Stakeholders
	Introduce key members of your team and their relevant expertise Highlight achievements, qualifications, or industry recognition	Who will be target of audience? Patients, providers, teams, processes, other?
9	Results/Traction	Prior ASP Success
	Present financial information, such as revenue, expenses, and profitability Outline key financial projections, including revenue growth and milestones	Highlight prior/current ASP "wins" Any promising pilot data? Supporting data (internal > local > regional > national)
10	Capital	Resource Request
	How much investment do you need? How will you use it? What are the associated terms?	What is your ask?
Extra	Informational Only	Informational Only
	Formalized prospectus, company materials, supplementary material	Specific data to respond to expected questions for concise slides presented