

building, and absorption, (3) policy and product development, (4) health benefits, and (5) broader economic benefits. **DISCUSSION/SIGNIFICANCE OF IMPACT:** This study will aid in characterizing the returns resulting from this research funding and identify its strengths and weaknesses. This study will inform our understanding of the diversity and breadth of outcomes resulting from Georgia CTSA-supported research, and the value pilot projects provide to clinical and translational science and the broader community.

2251

Assessing research impact: It takes a team

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OBJECTIVES/SPECIFIC AIMS: Dissemination of research findings through the published literature is a complex but critical part of the scholarly communication process. Additionally, this time point on the translational spectrum is a key objective of the National Clinical Association for Advancing Translational Sciences (NCATS). Tracking the dissemination of research outputs can be difficult to identify and evaluate. The purpose of this case study was 2-fold: (1) identify tools and resources available freely to the public and through university subscriptions used to assess research output; and (2) compare the effectiveness of these tools on tracking output at different levels of granularity. **METHODS/STUDY POPULATION:** The authors, Spectrum staff (D.A.) and School of Medicine librarian (M.B.), attended webinars hosted by other Academic Medical Center libraries conducting work on impact tracking and learned from vendor product managers about available tools and resources during on-site campus visits. Publications from Stanford's Clinical and Translational Science Award (CTSA) were used to track the diffusion of research outputs (e.g., number of citations, document types, research areas, relative citation ratio, CTSA's collaboration) via library subscription services (e.g., Web of Science and Scopus) and freely available tools (e.g., iCite and PubMed). **RESULTS/ANTICIPATED RESULTS:** The authors found certain tools were more inclusive in retrieving grant funded research outputs. For example, in the case of ULI grant (ULI TR001085, ULI TR000093, ULI TR025744), on a grant-level output, there were discrepancies in the number of publications retrieved: (1) PubMed found 644 outputs; (2) Web of Science found 497 outputs; and (3) Scopus found 190 outputs. After de-duplication, the search across Web of Science (WoS), Scopus, and PubMed yielded 899 publications. In total, 389 outputs were unique to PubMed; 165 were unique to WoS; and 90 were unique to Scopus. Future analysis will be conducted to identify the source of unique outputs from each database (e.g., conference proceeding, specific journals). Additional analysis based on other units of research outputs (e.g., author-level outputs and article-level outputs) are expected to yield similar discrepancies. **DISCUSSION/SIGNIFICANCE OF IMPACT:** Citation analysis is a valuable method of assessing research output and, to a larger extent, research impact in a given field. It can help investigators illustrate qualifications for undertaking new projects, highlight collaborations across schools and departments, justify a grant renewal, and/or highlight accomplishments for promotion. However, systematic and comprehensive evaluations are needed in tandem with citation analysis/bibliometric analysis to assess the translation and uptake of research outputs and activities that result in research impact. Furthermore, both investigators and staff need adequate time and training to process research outputs/activities and to effectively organize them in easily understood visualizations.

2443

Attitudes and preferences for return of results from next-generation sequencing

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OBJECTIVES/SPECIFIC AIMS: Objectives: Decreasing costs and increasing evidence for clinical utility have contributed to whole genome sequencing (WGS) becoming a clinical reality. While previous studies have surveyed the attitudes of patients and community members towards specific gene tests, an emerging literature has begun to describe the preferences of diverse recipients for WGS results. In this study, we sought to identify and synthesize the quantitative evidence on preferences for results from WGS using a systematic review of the literature. **METHODS/STUDY POPULATION:** We conducted a search of articles on PubMed including subject index terms WGS, whole exome sequencing, genome sequencing, secondary findings, incidental findings, attitudes, preferences, choices, utilities, stated-preferences, discrete choice experiment, and willingness-to-pay. We conducted 11 formal searches to refine the strategy and conducted a final search in December 2017. Duplicates were eliminated and a title and abstract review was conducted to select articles meeting inclusion criteria. **RESULTS/ANTICIPATED RESULTS:** Our search

strategy identified 79 publications meeting initial search criteria with 30 manuscripts meeting inclusion criteria. Of these, most studies were conducted with patient-participants enrolled in existing sequencing studies, while few engaged members of the general public. Of the studies conducted on patients, most were on the medical setting of cancer and related syndromes. The earliest publication date of a manuscript meeting our inclusion criteria was in 2012, yet the majority were published in 2015 or later. **DISCUSSION/SIGNIFICANCE OF IMPACT:** Between 2012 and 2015, we saw an increasing focus in the medical literature on understanding public and patient preferences for return of results from WGS and WES. Both public and patient populations participating in surveys expressed preferences for receiving results from next-generation sequencing, even if the results are secondary or incidental findings unrelated to the primary indication for sequencing. A primary factor related to patient interest in incidental or secondary findings is the extent to which these results can inform medical intervention. Few studies surveyed representative population-based samples, and this may be an area for future investigation.

2183

Balancing patient-centeredness and patient safety in the hospitals: The case of pain care and patient satisfaction

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OBJECTIVES/SPECIFIC AIMS: This study seeks to understand the relationship between opioid prescribing and patient satisfaction among non-surgical, hospitalized patients. As part of this study, we qualitatively examined challenges in delivering safe and patient-centered care through voices of physicians', and nurses.' **METHODS/STUDY POPULATION:** We collected data through in-person interviews using semi-structured guides tailored to the informant roles. Study participants came from 1 healthcare system located in a mid-Western state. Each interview lasted 30–45 minutes, was audio-recorded with consent, and transcribed for analysis. Two researchers each coded 17 transcripts for discussions around patient-centeredness (including patient satisfaction, patient experiences), and patient safety for hospitalized patients experiencing pain. Analysis followed a general inductive approach, where researchers identified themes related to the research questions using an open coding technique. They discussed and reached consensus on all codes, and extracted several preliminary themes. The analysis was supported by NVivo software. **RESULTS/ANTICIPATED RESULTS:** The following themes emerged: (1) complex decision-making process to prescribe opioids for hospitalized patients; (2) the role of objective findings in prescribing decisions; (3) bargaining process in prescribing opioids; (4) balancing patient-centeredness and patient safety for selected populations; (5) opioids are the predominant medications for pain care. **DISCUSSION/SIGNIFICANCE OF IMPACT:** Clinicians' decision to prescribe opioids for nonsurgical hospitalized patients is based on multiple factors, including patient's condition, patient's preference for pain medications, or standard hospital's pain care regimen. Interventions that improve clinicians' ability to prescribe opioids may be needed to improve delivery of patient-centered and safe pain care.

2412

Cost effectiveness analysis of operative Versus antibiotic management for uncomplicated appendicitis

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OBJECTIVES/SPECIFIC AIMS: (1) Evaluate the relative incremental cost-effectiveness [cost per quality-adjusted life year (QALY) gained] of antibiotics, laparotomy, and laparoscopy for the initial treatment of uncomplicated appendicitis. (2) Detect if the relative incremental cost-effectiveness of each treatment differs by age, namely in pediatric patients, adult patients, and geriatric patients. (3) Use deterministic and probabilistic sensitivity analyses to assess the robustness of our findings when varying multiple model parameters. **METHODS/STUDY POPULATION:** Study Population and Analytic Approach: The population under analysis is a simulated population of those aged 1–90 diagnosed with uncomplicated appendicitis with computed tomography (CT) in the emergency department. Pregnant women and those younger than 1 year old were excluded from our analysis. We simulated our population through a Markov state-transition simulation model. Using this model, we estimated the lifelong costs and effects on QALYs from the use of antibiotics, laparoscopy, and

laparotomy for a given hypothetical individual with uncomplicated appendicitis. This model allowed for the incorporation of both the short-term and long-term effects of each respective treatment option. The primary outcome of the model was the cost per additional QALY gained. The analysis was conducted using a healthcare perspective. A 100 age-year time horizon was used. A 3% discount rate was applied to both the costs and effects in the model. Transition states are depicted. Surgical state rates were derived from HCUP. Treatment failure of antibiotics was defined as recurrent appendicitis within one year of antibiotic treatment. This was determined using results from prior RCTs and a Cochrane review of antibiotic management for uncomplicated appendicitis. Recurrent appendicitis was defined as recurrent appendicitis after 1 year of antibiotic treatment, using rates of appendicitis applied to the general population by age group. National age-adjusted mortality rates were applied to account for death due to causes unrelated to appendicitis. To assess differential results by age, different acute and long-term outcome, cost, and state transition rates were applied to 3 age groups: a pediatric group (1–17 years old), an adult group (18–64 years old), and a geriatric group (65+ years old). As an individual progressed through the model until age 100, the respective parameters would change to adjust for the transitions between the 3 life stages. Outcomes After Appendicitis: Lifetime QALYs were incorporated throughout the study for short-term and long-term health states. There is limited availability of QALY data in the literature pertaining to the health states specific to appendicitis. Due to this limitation, however, calculated quality of life (QoL) indices for 2015 created by Wu *et al.* were utilized for this study. QALYs were subsequently derived by multiplying QoL by the appropriate duration of time spent in a respective health status. Transition rates between health states were abstracted from the existing literature. Costs: Direct medical costs were obtained from HCUP statistics from the 2014 fiscal year for all age groups in the nationwide network. This database contains all costs of care related to surgical appendicitis intervention, however it lacks costs associated with antibiotic-only management. To account for these costs, data was extracted from current available literature, and the resulting average was applied to our model. Sensitivity Analysis: One-way analyses by cost of procedure and effectiveness of antibiotic protocol were undertaken to account for regional variation in costs and improvements in antibiotic therapy, respectively. For cost of procedure sensitivity analysis, costs were varied by 1 standard deviation below and above the mean cost per treatment group per age. These costs were then compared to a designated reference group. Antibiotic sensitivity analysis was conducted by reducing the effectiveness of antibiotics from the maximum reported effectiveness down to 0, with the goal of obtaining a level of effectiveness at which antibiotics were no longer cost-effective. A probabilistic Monte-Carlo sensitivity analysis was then employed to determine the percent likelihood of each treatment arm being cost-effective at a level of \$100,000 per additional QALY. The probabilistic sensitivity analysis was then repeated to determine the percent likelihood of each treatment arm being the dominant option, in that it lowers costs and adds QALYs. RESULTS/ANTICIPATED RESULTS: Our model examined the cost-effectiveness of 3 different treatment options for patients with acute uncomplicated appendicitis: laparoscopic appendectomy, laparotomy appendectomy, and an antibiotic regimen. We first examined the cost-effectiveness of each of these strategies in comparison to laparotomy. Laparoscopic appendectomy was shown to be superior to laparotomy in regards to costs and QALYs for patients ages 18 to 65+, while there was very little difference for patients ages 1–17. For those aged 1–17, laparoscopy had an additional cost of \$90.00 with an associated gain of 0.1 QALYs compared with laparotomy. For those aged 18–64, laparoscopy had a net cost-savings of \$3437.03 with an associated gain of 0.13 QALYs compared with laparotomy. For those aged 65+, laparoscopy had a net cost-savings of \$5713.55 with an associated gain of 0.13 QALYs compared to laparotomy. Antibiotic management was superior to laparotomy as it relates to both costs and QALYs for all 3 age cohorts. For those aged 1–17, antibiotic management had a net cost-savings of \$5972.55, with an associated gain of 0.6 QALYs compared with laparotomy. For those aged 18–64, antibiotic management had a net cost-savings of \$6621.00 with an associated gain of 0.5 QALYs compared with laparotomy. For those aged 65+, antibiotic management had a net cost-savings of \$11,953.00 with an associated gain of 0.21 QALYs compared with laparotomy. We then assessed the cost-effectiveness of antibiotics relative to laparoscopy. In all 3 age groups, antibiotics added QALYs and were cost-saving. For those aged 1–17, antibiotic management had a net cost-savings of \$6062.55, with an associated gain of 0.6 QALYs compared with laparotomy. For those aged 18–64, antibiotic management had a net cost-savings of \$3183.97 with an associated gain of 0.5 QALYs compared with laparotomy. For those aged 65+, antibiotic management had a net cost-savings of \$6239.45 with an associated gain of 0.21 QALYs compared with laparotomy. Sensitivity Analysis: We first examined the effect of varying costs on our results. Costs for all interventions were varied by 1 standard deviation above and below the average costs used in our original model, yielding 3 cost estimate levels: high cost (1 standard deviation above), middle cost (average cost reported in model), low cost (1 standard deviation below). For all 3 cost estimate levels of antibiotics, antibiotics persistently dominated laparotomy for all 3 age groups. Laparoscopy dominated at all cost levels in age groups 18–64 and 65+ but had a positive ICER for both high and medium cost levels in the 1–17 age group. We then varied effectiveness (one minus the failure rate) of antibiotic treatment in each age

group to assess at what level of effectiveness to antibiotics become dominant relative to laparotomy. In ages 1–17, antibiotic treatment became dominant at 43.8%; in ages 18–64, antibiotic treatment became dominant at 33%; and in ages 65+, there was no level of antibiotic effectiveness that did not result in this therapy being dominant over laparotomy. Probabilistic Monte-Carlo sensitivity analysis is pending, but we anticipate antibiotics having a high likelihood of being both cost-effective and dominant relative to the other 2 treatment options. DISCUSSION/SIGNIFICANCE OF IMPACT: We performed a cost-effective analysis comparing surgery versus antibiotic management for uncomplicated appendicitis. Our study found that antibiotic therapy was the dominant strategy in all age groups as it yielded lower costs and additional QALYs gained compared with laparotomy and laparoscopy. Appendicitis is the most common surgical emergencies worldwide, with a lifetime risk of 6.9% in females and 8.6% in males (Körner 1997). For over 100 years, open appendectomy had been the established treatment for appendicitis, but current management has evolved with the advent of laparoscopy and now growing use of antibiotics for treatment of appendicitis. There is growing interest in nonoperative management of uncomplicated appendicitis, given both an aging population that is increasingly frail and vulnerable to surgical complications and concerns over skyrocketing medical costs. Our model showed that antibiotic-only management was cost-effective in all age groups. This has important implications for management of appendicitis, where current management is to offer antibiotic-only management only in the “rare cases” where the patient is unfit for surgery or refuses surgery. Our data show that medical management of appendicitis not only is cheaper, but also provides more QALYs in all age groups. Our study has several limitations. First, we conducted our analysis under the assumption that all patients will be cured of appendicitis following surgical intervention. Some patients following appendectomy will develop symptoms of appendicitis and be diagnosed with “stump appendicitis,” which can occur in stumps as short as 0.5cm and can present as late as 50 years following initial surgery (Kanona, 2012). Additionally, any intraperitoneal surgery can lead to late complications such as small bowel obstruction from adhesions following surgery. Thus, our assumption that patients following appendectomy will return to the general population’s QALYs and mortality rate is not necessarily an accurate reflection of all clinical courses. However, the overwhelming majority of appendectomy patients recover fully post-surgery and we do not believe the above complications would significantly change our analysis. We also assumed that all patients with recurrent appendicitis following medical management would undergo surgery. However, patients who underwent nonoperative management at initial appendicitis may be more likely to be ineligible for surgery or refuse surgery during this second case of appendicitis. In addition, data were sparse for QALYs for the complications of open and laparoscopic surgery. We estimated these numbers from the EQ-5D, which while perhaps not accurate, we believe to be the best approximation given the available data. The next steps in evaluating the use of nonoperative management in uncomplicated appendicitis would be to validate the use of nonoperative management in elderly populations and to develop more accurate diagnostic criteria for uncomplicated Versus complicated appendicitis. Additionally, with increasing attention on antibiotic-resistant micro-organisms, policy decisions on the use of nonoperative management must also consider antibiotic stewardship. While one dose of perioperative antibiotics is indicated for appendectomy, treatment strategies from trial protocols for antibiotic-only management require significantly more antibiotics—some protocols require 1–3 days of IV antibiotics followed by up to 10 days of oral antibiotics. This study provides a cost-effectiveness analysis of treatment options for acute uncomplicated appendicitis among varying age groups. Our analysis demonstrates the benefit of antibiotics for initial therapy in the management of acute uncomplicated appendicitis. While the historic gold standard of laparotomy still is present as the first line treatment option in many physicians’ minds, new evidence indicates that the advancement of other methods, whether surgical via laparoscopic removal of the appendix or medical via improved antibiotic regimens, suggests better alternatives exist. Our study builds upon a growing body of literature supporting initial treatment of acute uncomplicated appendicitis with antibiotics, before surgical intervention.

2263

Creating a reference analytics morphomics population from surgical patient cross-sectional imaging

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OBJECTIVES/SPECIFIC AIMS: Patient factors such as body mass index and functional status are commonly used in surgical decision-making and prediction of outcomes. Morphomic analysis uses semi-automated 3D cross-sectional imaging analysis to quantify tissue, organ, and bone geometry and density. These data can be