improve practice, including developing a dashboard to audit and provide clinician feedback, providing clinician education, creating standardized treatment agreements in the EHR, using or building clinical decision support tools within the EHR, integrating the prescription drug monitoring program within the EHR, and updating opioid initiatives and workflow. Based on the preliminary outcomes, one system saw significant improvement over seven quarters in two measures of guideline-concordant care: decreased days' supply for new opioid prescriptions to three days or less (OR = 1.34; CI 1.06–2.89), and increased rates of urine drug testing for patients on LTOT (OR = 1.81; CI 1.12–3.08). We expect to have complete results in February 2021 for five systems.

Conclusions: Initial results suggest the potential for improvement in safer opioid prescribing and management practices after implementing a dedicated QI initiative within participating health systems.

Implications for Policy or Practice: Supporting health systems in their opioid QI initiatives may improve their ability to measure and improve their prescribing practices and advance safer, more effective pain management.

Primary Funding Source: Centers for Disease Control and Prevention.

MEASURING SAFETY, QUALITY, AND VALUE

The Impact of Inter-ICU Transfer Timing on Clinical and Economic Outcomes

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Research Objective: To examine the impact of transfer timing on in-hospital mortality, hospital length of stay (LOS), and cumulative charges on acute respiratory failure (ARF) patients.

Study Design: We conducted a retrospective, quasi-experimental study utilizing Healthcare Cost Utilization Project databases (HCUP-SID) in 5 states (FL, MD, MS, NY, WA) during 2015–2017. To control for potential selection bias, we propensity score matched patients (1:1) to model propensity for early transfer using *a priori* defined patient demographics, clinical, and hospital variables that influence the probability of inter-ICU transfer. Doubly-robust multivariable modeling was used to examine the impact of transfer timing on in-hospital mortality, hospital length of stay (LOS), and cumulative charges.

Population Studied: Patients with ICD-10 codes for respiratory failure and mechanical ventilation who underwent an inter-ICU transfer, grouping as early (≤ 2 days) and delayed transfers (3+ days).

Principal Findings: 6718 patients with ARF underwent inter-ICU transfer, 68% of whom (n = 4552) were transferred early (≤ 2 days). Propensity score matching yielded 3774 well-matched patients for this study. Unadjusted outcomes were all lower in the early vs. delayed transfer cohort: in-hospital mortality (24.4% vs. 36.1%; p < 0.0001), length of stay (8 vs. 22 days; p < 0.0001), and cumulative charges (118,686 vs. 308,977; p < 0.0001). Through fully-adjusted multivariable modeling, we found patients who were transferred early had 66% lower odds of in-hospital mortality than those whose transfer was delayed (OR 0.34, 95% CI: 0.29–0.40). Additionally, the early transfer cohort had lower LOS [6.8 fewer days (10.8 vs. 17.6; p < 0.001)], and lower cumulative charges [$94,471 less ($207,211 vs. $301,682; p < 0.001)].

Conclusions: Our study is the first to use a large, multi-state sample to evaluate the practice of inter-ICU transfers in ARF. This definition of early and delayed transfers is also distinct from past work, which has more commonly grouped all transfers together. The main finding of our study is that early transfers have a 66% decrease in mortality. These findings are vital in designing prospective studies evaluating evidence-based transfer procedures, policies, and guidelines.

Implications for Policy or Practice: Acute respiratory failure (ARF) leads to 2.5 million ICU admissions annually, resulting in over 30% mortality with an estimated cost of $27 billion. Current data estimates that 1 in 30 patients with ARF will undergo an inter-ICU transfer, typically to receive a higher level of care. Although implications of inter-ICU transfer are varied, there are currently no studies evaluating the impact of timing of transfer on outcomes. Our study suggests earlier ICU transfer may yield lower mortality rates, decreased LOS, and cumulative charges. The study however implies only associations and not causation which will need to be evaluated in future studies.

Primary Funding Source: National Institutes of Health.

Changes in Primary Care Telehealth Use and Impact on Acute Care Visits for Ambulatory Care-Sensitive Conditions during COVID-19

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Research Objective: The COVID-19 pandemic forced a dramatic shift from in-person care to telehealth, with an overall decrease in outpatient utilization. These changes particularly stressed outpatient care delivery and may have resulted in decreased availability and access to primary care for patients, potentially increasing otherwise avoidable emergency department (ED) visits and hospitalizations. One commonly used indicator of primary care access and quality is acute care visits for ambulatory care-sensitive conditions (ACSCs), such as for pneumonia, uncontrolled diabetes, or congestive heart failure exacerbations. Our study examined differences in telehealth adoption across practices and evaluated the association between telehealth adoption and ACSC visits.

Study Design: We conducted a retrospective study of claims data from a large commercial insurer in Michigan. We first profiled telehealth adoption by primary care practices during March–July 2020. We defined a practice's "telehealth conversion rate" as the proportion of visits conducted via telehealth during this period compared to the total number of visits during the same period in 2019. Then, to enable comparison between groups at a time when both outpatient and acute care visits were in flux, we used a differences-in-differences (DID) model to determine whether varying levels of primary care telehealth conversion were associated with differences in acute care visits (ED visits and hospitalizations) for ACSCs from June–September 2020. We examined visit rates for acute and chronic ACSCs separately, controlling for practice size, in-person visit volume, and zip code-level attributes as well as patient characteristics (age, gender, comorbidities). We performed sensitivity analyses using varying definitions of telemedicine conversion rates and multiple model specifications.

Population Studied: Six million Blue Cross Blue Shield of Michigan beneficiaries across 3780 primary care practices from January 2019 to September 2020.

Principal Findings: Average primary care practice telehealth conversion rate was 25% (median 10%), and 29% of practices had no telehealth claims identified. Practices that did not adopt telehealth tended to be smaller and were more likely to be in rural areas. We found no significant differences in the rate of ED visits and hospitalizations for ACSCs by practice-level telemedicine conversion tertile after adjusting for practice case-mix, as shown in Table 1. Sensitivity analyses showed similar results.

Conclusions: Beneficiaries within a large commercial payer experienced rapid shifts from in-person to telehealth for their primary care, though telehealth adoption was not evenly distributed, with smaller and more rural practices being less likely to adopt telemedicine. These changes did not seem to obviously help or harm patients as ED visits and hospitalizations for ACSCs were similar across groups.

Implications for Policy or Practice: Widespread substitution of telehealth for in-person care had little impact on cost of care with respect to avoidable ED visits and hospitalizations in the near-term. Additional research should continue to monitor this trend as health care utilization stabilizes beyond the pandemic.

Primary Funding Source: University of Michigan Institute for Health Policy and Innovation.

TABLE 1 Differences-in-differences model of practice telemedicine conversion rate on acute care visits for acute and chronic ACSCs

	Acute ACSC aOR (95% CI)	Chronic ACSC aOR (95% CI)
Telemedicine tertile (mean telemedicine conversion rate)		
Low (9%)	ref	ref
Medium (30%)	0.98 (0.91–1.07)	0.98 (0.76–1.26)
High (66%)	1.07 (0.98–1.17)	1.14 (0.86–1.50)

Updating an Electronic Measure of Screening Colonoscopy Overuse in a Large Integrated Healthcare System to Examine Trends and Variation in Overuse

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Research Objective: Overuse of screening colonoscopy can lead to patient harm and wasteful use of resources. We previously developed an ICD-9 based measure to detect screening colonoscopy overuse in a large integrated healthcare system. This measure was highly specific, suggesting that cases identified as overuse were true positives, but had low sensitivity (likely to miss cases of overuse). We sought to update and test this previously validated measure for use in ICD-10 and assess trends and variation in colonoscopy overuse in a large integrated healthcare delivery system.

Study Design: Retrospective cohort study of Veterans Health Administration (VHA) administrative data, with measure validation via manual record review.

Population Studied: Index screening colonoscopy encounters at 117 VHA facilities in 2017.

Principal Findings: 269,572 colonoscopies were performed in VHA in 2017. After applying exclusion criteria (non-index procedures, procedures in patients at increased risk of colorectal cancer, inpatient procedures, colonoscopy for non-screening indication within 12 months), 88,143 colonoscopy encounters remained. Validating the updated ICD-10 based electronic overuse measure ("Updated Measure") against the gold standard of manual record review in a random sample of 511 cases, the Updated Measure had similar specificity to the ICD-9 based measure (96% vs. 97%) but was significantly more sensitive (92% vs. 20%). The sensitivity and specificity of the Updated Measure were robust both among sites with the lowest levels of overuse (sensitivity 100%, specificity 97%) and sites with the highest levels of overuse (sensitivity 93%, specificity 97%).

Applying the Updated Measure, 24.5% of screening colonoscopy encounters (21,600/88,143) met the definition of overuse (as defined in *J Gen Intern Med* 2016;31[Suppl 1]:53–60), similar to levels in 2011–13 (23%). Of these 21,600 colonoscopies meeting overuse criteria, the top 2 reasons for overuse in both periods were screening colonoscopy performed <9 years after previous colonoscopy (45% in 2017 vs. 35% in 2011–13) and screening colonoscopy performed <6 months after negative FOBT (23% in 2017 vs. 31% in 2011–13).