

Higher Electronic Health Record (EHR) Functionality Lowers Urban Hospital Costs **But Rural Impacts Are Minimal**

SEPTEMBER 2021 POLICY BRIEF

KEY FINDINGS

- Existing literature on the relationship between EHRs and hospital costs is inconclusive, and is largely missing a comparison of rural and urban facilities.
- Past literature is incomplete since it has mainly focused on EHR adoption, not EHR functionality or use.
- EHR functionality is defined as having a computerized system that has replaced paper records for specific features within 5 main categories: (1) electronic clinical documentation (e.g. physician notes); (2) results viewing (e.g. diagnostic test imaging); (3) computerized physician order entry (e.g. laboratory tests); (4) decision support (e.g. drug allergy alerts); (5) other (e.g. telehealth).
- Increases in EHR functionality (i.e. the number of EHR functions available) are associated with reductions in total hospital costs, driven mainly by lower outpatient costs.
- The effect of increased EHR functionality on outpatient costs is exclusively seen in urban hospitals, where a wide array of EHR functions are associated with cost decreases.
- Rural hospitals do not benefit from the cost reductions associated with increasing EHR functionality as their urban counterparts.
- Improvements in EHR functionality do not seem to significantly reduce costs for rural hospitals.

INTRODUCTION

Medical professionals and policymakers have been optimistic about the potential of Electronic Health Records (EHRs) to reduce hospital costs (i.e. the expenses incurred by a hospital in providing care). However, previous literature on the subject is mixed, and few studies have examined whether rural hospitals benefit the same as urban facilities. **Rising costs are particularly problematic for rural hospitals.** In the United States, 136 rural hospitals have closed between 2010 and 2021,¹ and many of these closed hospitals displayed negative operating margins prior to closure (i.e. revenues minus costs).²

The trend in rural hospitals closure is a significant source of concern to rural health policymakers and providers, especially since the areas with the highest number of rural hospital closures are some of the country's most vulnerable. It has been shown that **rural hospital closures may disproportionately affect racial and ethnic minorities and communities with higher unemployment.**^{3,4}

If policymakers are focusing on effective use of Electronic Health Records (EHRs), it is time to move beyond adoption and examine how EHR functionality and use influence hospital costs.

METHODOLOGY

This study uses a national sample of 1,989 general service hospitals over the period 2016-2019 to assess the impacts of EHR implementation on various categories of hospital costs. The sample includes only hospitals classified as “general medical and surgical,” removing specialty hospitals. Roughly two-fifths of these hospitals are in a rural location (identified based on the Federal Office of Rural Health Policy’s list of rural ZIP codes), including 23% classified as Critical Access Hospitals (CAHs). We control for the main hospital characteristics expected to impact costs, such as the total number of beds, employees, and discharges, and case mix. We explore whether the relationships between EHR functionality and hospital costs are different for hospitals in rural (vs. urban) locations. We define EHR functionality as the number of EHR functions available for a hospital. The American Hospital Association’s (AHA) Annual Survey of Hospitals Information Technology (IT) Supplement recognizes the existence of twenty-seven EHR functions divided into the five main categories defined earlier.

We match data on EHR implementation and functionality from the American Hospital Association’s Annual Survey of Hospitals Information Technology Supplement with cost data from the American Hospital Directory (AHD) for the years 2016 – 2019. AHD is a private agency that provides data from hospitals nationwide, using public and private sources such as Medicare claims data and hospital cost reports. The AHA IT supplement contains detailed data on the EHR functionality in place and various metrics on the actual use of the system within the hospital.

RESULTS

1. Increasing levels of EHR functionality – and not simple adoption or “use” – are associated with aggregate cost reductions;
2. Significant aggregate cost reductions are exclusively seen in urban hospitals;
3. Urban EHR-related cost reductions are driven by outpatient costs, but occur across two of the three dominant sub-categories of costs (general costs and outpatient costs; no relationships are found for inpatient costs); and
4. EHR sub-categories seem to impact rural and urban costs differently: a wide variety of functions are associated with significant cost reductions for urban facilities, while no EHR function is associated with significant cost reductions in rural locations (Table 1). This lack of a significant relationship holds for CAH facilities.

Table 1. A wide array of EHR functions is associated with cost decreases for urban hospitals, but no EHR function is associated with significant cost decreases for rural hospitals.

EHR Functionality	URBAN			RURAL		
	Total costs	General costs	Outpatient costs	Total costs	General costs	Outpatient costs
Electronic clinical documentation	0.36%	0.48%				
Results viewing	0.57%	0.54%	0.87%			
Computerized provider order entry	0.40%		0.71%			
Decision support			0.53%			
Other functionalities						

Note: the relationships shown are for each added function in a category. Example: an added function in electronic clinical documentation is associated with a 0.36% reduction in total costs and a 0.48% reduction in general costs for urban hospitals.

Significant variation exists in costs for rural vs. urban hospitals, with total costs being seven times higher in urban locations (Figure 1). Costs have increased over time for both rural and urban hospitals, however urban costs have increased at a higher rate.

Further, the cost composition is different for rural/urban status, with outpatient visits comprising a larger percentage of overall costs in rural areas (Figure 2). This is consistent with recent research documenting an increase in outpatient visits among rural hospitals – while also noting the importance of this revenue stream for rural facilities.⁵

Figure 1. Cost breakouts for rural and urban hospitals in millions of dollars.

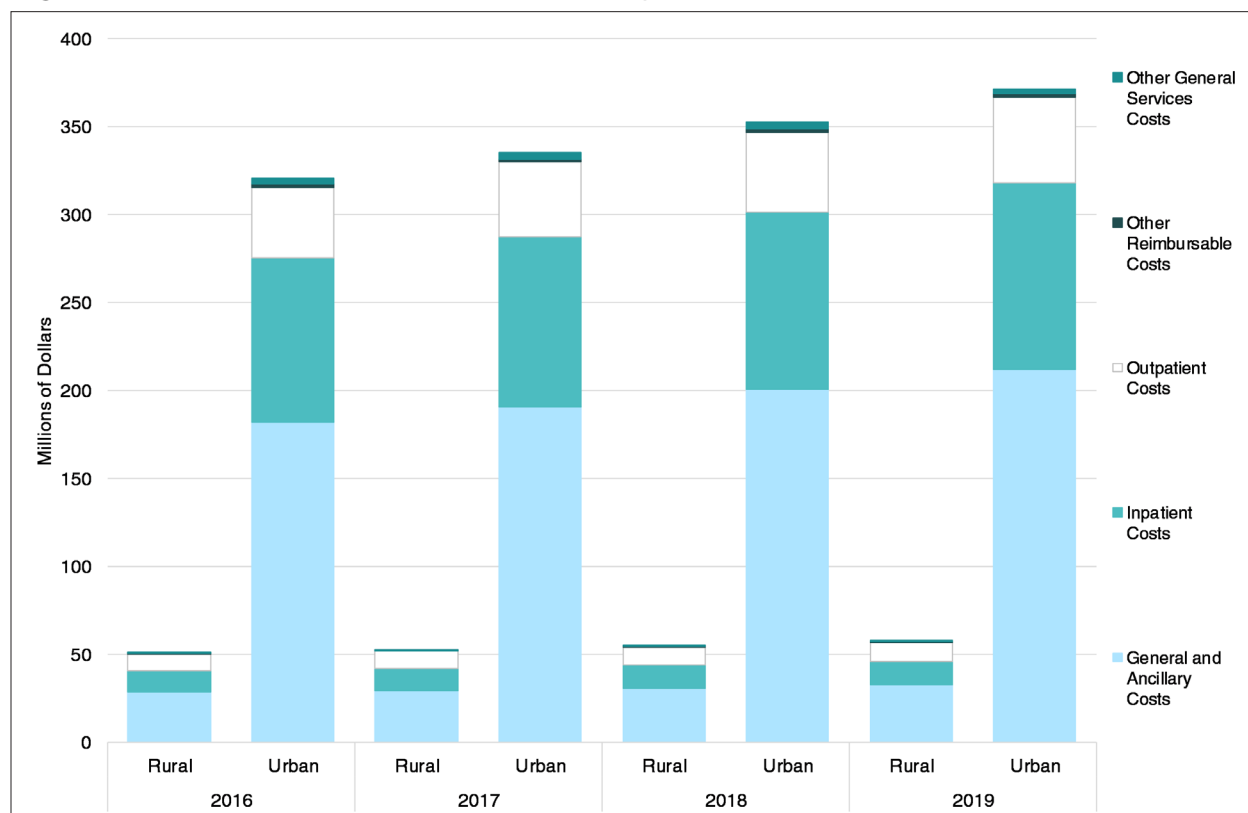
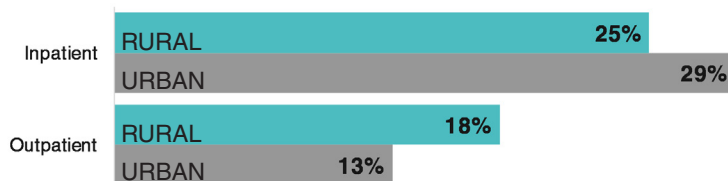


Table 1 shows, however, that EHR functionality is not associated with cost savings for rural outpatient procedures (despite their increasing prevalence).

Figure 2. Rural hospitals tend to have a higher percentage of costs in outpatient services than **urban hospitals**, but the findings show that there is no cost reduction from increasing EHR functionality in rural facilities.



DISCUSSION

While our main finding that increasing EHR functionality leads to lower own-hospital costs is likely of interest to hospital administrators, the results are less optimistic for rural hospitals. Given that these facilities are the most likely to be facing a negative operating margin, **it does not appear that investing in additional total EHR functionality is an easy way for rural hospitals to reduce short-term costs.** Urban hospitals, on the other hand, can see significant savings. An average urban hospital that added two EHR functions between 2016 and 2019 would be expected to see an associated total cost decrease of over \$890,000 during that time.

Our third finding emphasizes that the urban cost reductions are predominantly found in the outpatient cost category, but no such relationship is observed for rural hospitals. This is particularly important due to the higher proportion of costs associated with outpatient services in rural facilities. This may be because physician practices that send patients to hospitals for outpatient procedures are more likely to participate in Health Information Exchanges (HIEs) in urban locations,⁶ resulting in less time (and cost) spent gathering data at the hospital. No such relationships are found for rural hospitals. Additional research should explore why these relationships hold in urban, but not rural, facilities.

This study is limited by the self-selection of hospitals that completed the IT survey over the full 4-year period, and the self-reported nature of that data. Further, it may be possible that unmeasurable confounding factors are impacting the association between EHR functionality and cost savings, although the inclusion of hospital-level fixed effects reduces this concern.

IMPLICATIONS

These findings have implications for policy discussions. While the vast majority (95%) of the hospitals in our sample have certified

EHRs, a significant portion still lack functionality in categories shown to significantly reduce costs (notably, results viewing and decision support). Rural hospitals (and in particular, CAHs) are more likely to lack these functionalities. Incentives similar to those extended during the HITECH Act could be focused on improving these specific capabilities;⁷ however, our results suggest that they would only be effective at reducing costs in urban facilities.

The dramatic discrepancies across rural – urban locations also imply that additional research should attempt to tackle why specific EHR relationships are so much stronger for urban facilities. Insight into why EHR functionalities reduce outpatient costs in urban, but not rural, hospitals would be particularly useful given the increasing importance of outpatient services for rural facilities. Additionally, other perceived benefits of EHRs (such as a greater ability to participate in value-based care, or to achieve improved long-term health outcomes) should be further explored – with particular consideration for rural context.

AUTHORS*

Claudia Alejandra Rhoades, Ph.D. Student
Department of Agricultural Economics, Oklahoma State University

Brian E. Whitacre, Professor and Neustadt Chair
Department of Agricultural Economics, Oklahoma State University

Alison F. Davis, H.B. Price Professor and Director, Center for Economic Analysis of Rural Health (CEARH)
Department of Agricultural Economics, University of Kentucky

*For more information about the research in this policy brief, contact Dr. Brian Whitacre (brian.whitacre@okstate.edu)

ENDNOTES

¹ The Cecil G. Sheps Center for Health Services Research. University of North Carolina. 2021. Data available online: <https://www.shepscenter.unc.edu/programs-projects/rural-health/rural-hospital-closures/>

² Kaufman, B. G., Thomas, S. R., Randolph, R. K., Perry, J. R., Thompson, K. W., Holmes, G. M., & Pink, G. H. (2016). The rising rate of rural hospital closures. *The Journal of Rural Health*, 32(1), 35-43.

³ Thomas, S. R., Holmes, G. M., & Pink, G. H. (2016). To what extent do community characteristics explain differences in closure among financially distressed rural hospitals?. *Journal of Health Care for the Poor and Underserved*, 27(4), 194-203.

⁴ Hsia, R. Y., Kellermann, A. L., & Shen, Y. C. (2011). Factors associated with closures of emergency departments in the United States. *Journal of the American Medical Association*, 305(19), 1978-1985.

⁵ American Hospital Association. (2019). Rural Report: Challenges Facing Rural communities and the Roadmap to Ensure Local Access to High-quality, Affordable Care. Available online: <https://www.aha.org/system/files/2019-02/rural-report-2019.pdf>

⁶ Yaraghi, N., Ye Du, A., Sharman, R., Gopal, R., & Ramesh, R. (2015). Health information exchange as a multisided platform: Adoption, usage, and practice involvement in service co-production. *Information Systems Research* 26(1), 1-18.

⁷ Adler-Milstein, J. & Jha, A. (2017). HITECH Act drove large gains in hospital electronic health record adoption. *Health Affairs* 36(8):1416-1422.

Suggested Citation: Rhoades CA, Whitacre BE, and Davis AF. Higher Electronic Health Record (EHR) Functionality Lowers Urban Hospital Costs But Rural Impacts Are Minimal. *CEARH Policy Brief*. September 2021. http://cearh.ca.uky.edu/files/cearh_ehr_policy_brief_sept_2021.pdf

EHR
implementation
is not a short-
term solution,
but a longer-term
investment whose
payoff is realized as
capability is added.
