

REPORT 32 OF THE BOARD OF TRUSTEES (A-19)
Impact of High Capital Costs of Hospital EHRs on the Medical Staff
(Reference Committee G)

EXECUTIVE SUMMARY

At the 2018 Annual Meeting Policy D-225.974, “Impact of the High Capital Cost of Hospital EHRs on the Medical Staff,” was adopted by the House of Delegates (HOD). The policy asks the American Medical Association (AMA) to study the long-term economic impact for physicians and hospitals of EHR system procurement, including but not limited to its impact on downsizing of medical staffs and its effect on physician recruitment and retention. This report provides the requested study of documented economic and financial impacts of procuring electronic health record systems.

Implementing or upgrading an Electronic Health Record (EHR) in a medical practice, while beneficial in many ways, comes with a variety of costs. These costs include financial, productivity, workforce/personnel, and clinician and patient satisfaction. Long-term, these costs can all have effects on a health system’s medical staff/workforce. These impacts, and the long-term economic and financial costs, are not widely studied or discussed.

REPORT OF THE BOARD OF TRUSTEES

B of T Report 32-A-19

Subject: Impact of High Capital Costs of Hospital EHRs on the Medical Staff

Presented by: Jack Resneck, Jr., MD, Chair

Referred to: Reference Committee G
(Rodney Trytko, MD, Chair)

1 INTRODUCTION

2

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4 EHRs on the Medical Staff," was adopted by the House of Delegates (HOD). The policy asks the
5 American Medical Association (AMA) to study the long-term economic impact for physicians and
6 hospitals of EHR system procurement, including but not limited to its impact on downsizing of
7 medical staffs and its effect on physician recruitment and retention.

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9 This report provides the requested study of documented economic and financial impacts of
10 procuring electronic health record systems.

11

12 BACKGROUND

13

14 Electronic health records (EHRs) are an integral part of the vast majority of health care delivery in
15 the United States. In 2017, 99 percent of large, 97 percent of medium, and 93 percent of small rural
16 non-federal hospitals had a certified EHR product in operation.¹ In 2015, the most recent year for
17 which data could be found, 84 percent of non-federal acute care hospitals had at least a basic EHR
18 in operation, and 87 percent of office-based physicians were using an EHR.² The benefits of EHR
19 use are well-documented, however, so are the growing concerns with the amount of time and types
20 of tasks required in using an EHR in practice.^{3,4} There is also evidence showing the often-
21 burdensome financial investment that implementing and maintaining an EHR system requires.

22 Although there are several studies quantifying the financial investment, the reported costs of EHR
23 implementation vary greatly across studies,^{5,6} owing most likely to differences in geographic
24 locations, practice size and type, and EHR type. One study estimated EHR implementation in a
25 five-physician practice would cost \$233,297, or \$46,659 per physician, in the first year.⁷ In 2017
26 some hospitals and health systems reported EHR implementations costing from \$25 million up to
27 \$10 billion.⁸ The differences in practice size and type, EHR type, health information technology
28 (HIT) budgets, specialty, and rural/urban location, make it difficult to accurately quantify costs that
29 are representative across health care practices in the U.S. In addition, the Centers for Medicare &
30 Medicaid Services (CMS) has not updated the practice expense component of the resource-based
31 relative value scale (RBRVS) physician fee schedule in nearly a decade, compounding the lack of
32 valid comparisons and the potential underpayment to physicians for expenses required to maintain
33 a current EHR system. Notwithstanding the challenges in quantifying costs, it is important to
34 consider and understand the long-term impacts of the financial commitment required to implement
35 or upgrade an EHR, including the effects on the physician and clinician workforce.

1 The financial costs of implementing an EHR system comprise many factors, including software
2 licensing, projected maintenance, fees, and costs for initial and ongoing training and labor. Some
3 hospitals include the salaries of existing HIT staff in their cost estimates. Others may include the
4 costs of hardware such as new computers, tablets or other devices. These costs can add up to
5 millions, and even billions of dollars for the largest purchasers.⁹ Additional costs arise when
6 expenses exceed budgets and when organizations invest in upgrading or optimizing their original
7 EHR system. Other costs, sometimes attributable to EHR implementation, can occur in the form of
8 workforce attrition that happens when organizations cut staff to reduce costs or physicians reduce
9 work hours or leave practice due to frustrations with administrative burden created by EHRs.
10 Despite these challenges, EHRs will continue to be a principal component of health care delivery in
11 the U.S. However, for the technology to be a viable and sustainable solution for practices of all
12 sizes and types, it will be important to know the potential long-term effects the high
13 implementation, optimization, and maintenance costs will have on the ability to sustain existing
14 medical staff and recruit new staff to meet the growing demand of patients' needs.
15

16 **AMA POLICY**

17
18 The AMA has extensive policy supporting the use of EHRs and encouraging stakeholders to
19 implement policies, technology improvements, and utilization standards to minimize the financial
20 burden and maximize efficiency and safety in the use of EHRs.

21
22 The AMA is committed to working with Congress and insurance companies to appropriately align
23 incentives as part of the development of a National Health Information Infrastructure, so that the
24 financial burden on physicians is not disproportionate when they implement health care
25 technologies in their offices. The AMA also continues to advocate for and support initiatives that
26 minimize the financial burden to physician practices of adopting and maintaining EHRs (Policy D-
27 478.996, "Information Technology Standards and Costs"). The AMA is working with EHR
28 vendors to promote transparency of actual costs of EHR implementation, maintenance and
29 interface production (Policy D-478.973, "Principles for Hospital Sponsored Electronic Health
30 Records").
31

32 The AMA supports the drive for innovation in the use of EHRs to develop best practices
33 concerning key EHR features that can improve the quality, safety, and efficiency of health care
34 (Policy D-478.976, "Innovation to Improve Usability and Decrease Costs of EHR Systems for
35 Physicians"). In addition, the AMA advocates for legislation or regulation to require all EHR
36 vendors to utilize standard and interoperable software technology components to enable cost
37 efficient use of electronic health records across all health care delivery systems including
38 institutional and community-based settings of care delivery. The AMA works with CMS to
39 incentivize hospitals and health systems to achieve interconnectivity and interoperability of
40 electronic health records systems with independent physician practices to enable the efficient and
41 cost-effective use and sharing of electronic health records across all settings of care delivery
42 (Policy D-478.995, "National Health Information Technology").
43

44 It is AMA policy that the cost of installing, maintaining, and upgrading information technology
45 should be specifically acknowledged and addressed in reimbursement schedules, which if
46 represented appropriately would help offset these costs for many practices (Policy H-478.981,
47 "Health Information Technology Principles"). Furthermore, the AMA advocates for inclusion of
48 payment supplements in the current and proposed payment systems specifically to cover the costs
49 of maintaining (including upgrades of) EHRs and continuously evaluates and monitors the cost to
50 physicians and their practices of maintaining and upgrading EHRs (Policy D-478.975,
51 "Maintenance Payments for Electronic Health Records").

1 DISCUSSION

2

3 *Costs of implementing or upgrading an EHR system*

4

5 The costs associated with implementing and/or optimizing an EHR system have been shown to
6 vary significantly across practices and organizations. This is based on a variety of factors,
7 including but not limited to, practice type and size, infrastructure needs, staffing resources, and
8 maintenance fees. Due to the variability of factors, precise costs are difficult to confirm across
9 practice settings.

10

11 Several studies and reports have endeavored to document and estimate the immediate and ongoing
12 costs of EHR implementation. One study estimated EHR implementation for a solo physician in
13 practice to cost \$163,765, inclusive of labor and hardware costs. In the same study, it was
14 estimated EHR implementation in a five-physician practice would cost \$233,297, or \$46,659 per
15 physician, in the first year.⁷ In 2017 some hospitals and health systems reported EHR
16 implementations costing from \$25 million up to \$10 billion.⁸

17

18 In conjunction with evaluating the costs of implementation, several studies have also described the
19 cost-benefit analysis of EHRs in various practice settings. A 2003 study of EHR implementation in
20 a primary care practice estimated the net benefit from using an electronic medical record for a five-
21 year period was \$86,400 per provider. Benefits resulted primarily from savings in drug
22 expenditures, improved utilization of radiology tests, better capture of charges, and decreased
23 billing errors. Using a five-way sensitivity analysis that accounted for variables such as proportion
24 of capitated patients, patient panel size, and software and hardware costs, this study showed results
25 ranging from a \$2,300 net cost to a \$330,900 net benefit to the organization. However, among fee-
26 for-service patients, a large portion of the savings from improved utilization may accrue to the
27 payer instead of the provider organization.¹⁰ This study was completed using data from an
28 internally developed EMR at Partners HealthCare, an integrated network formed by Brigham and
29 Women's Hospital and Massachusetts General Hospital.

30

31 Another study found that implementation of EHRs in solo or small practices incurred initial costs
32 of approximately \$44,000 per FTE provider per year, including software, hardware and lost
33 revenue from reduced productivity. Ongoing costs were estimated at \$8,500 per FTE provider per
34 year, including software and hardware maintenance or replacement, and support staff. This study
35 also found the average practice paid for its initial and cumulative ongoing EHR costs within two
36 and a half years, and began to see more than \$23,000 in net benefits per FTE provider per year.
37 Also of note, participants in this evaluation reported that providers worked longer hours for about
38 four months after implementation, as they became more familiar with the system.¹¹

39

40 A 2013 projection of return on investment (ROI) five years after an EHR pilot predicted each
41 physician would lose nearly \$44,000 and only 27% of practices surveyed would achieve a positive
42 ROI. An additional 14% would experience a net gain if they received the federal meaningful use
43 incentive. This analysis revealed the largest difference between practices with a positive return on
44 investment and those with a negative return would be the extent to which they used their EHRs to
45 increase revenue, primarily by seeing more patients per day or by improved billing that resulted in
46 fewer rejected claims and more accurate coding.¹²

47

48 A 2014 ROI analysis found that primary care practices recovered their EHR investments within an
49 average period of 10 months. An observed increase in the number of active patients, the increase in
50 the active-patients-to-clinician-FTE ratio, and the increase in the clinic net revenue are positively

1 associated with the EHR implementation, likely contributing substantially to the 10-month average
2 break-even point.¹³

3
4 In addition to initial implementation costs, upgrades and optimizations require significant
5 resources, but can help the organization realize cost and time efficiencies. In 2017, 38 percent of
6 health care CIOs indicated “EMR optimization” as their organization’s top item planned for capital
7 investment through 2020.¹⁴ A 2018 case study at a Colorado hospital employed an optimization
8 strategy that saved them between \$300,000 and \$500,000 per year, in addition to a 53 percent
9 increase in cash collections since go-live, a 15 percent decrease in days in accounts receivable,
10 assistance from time-saving tools that automatically track changes to payer rules, authorization
11 management services that free up staff to take on high-value work, and reduced operating costs
12 with transparent pricing that includes upgrades and interfaces.¹⁵

13
14 Furthermore, to encourage organizations to adopt HIT technology and specifically EHR systems,
15 the federal government provided incentives to those providers who met “meaningful use” standards
16 through the Health Information Technology for Economic and Clinical Health (HITECH) Act of
17 2009. As of October 2018, CMS reported payments of \$38.4 billion to almost 550,000 Medicare
18 and Medicaid providers, or approximately \$65,000 per provider. The Medicare Access and CHIP
19 Reauthorization Act of 2015 (MACRA) sunset the meaningful use program for physicians
20 participating in Medicare. Physicians and hospitals participating in CMS programs now fall under
21 Promoting Interoperability (PI) program requirements.¹⁶ The Quality Payment Program, which
22 replaced the Medicare meaningful use program, sunset the HITECH Act meaningful use
23 incentives. However, PI participants in Medicaid are still eligible for incentive payments through
24 2021. It should be noted, however, that practices that did not implement an EHR system or were
25 not eligible for the meaningful use program did not receive incentive payments.

26
27 *Staff/workforce reductions resulting from EHR investment*

28
29 Many healthcare organizations have reported reductions in workforce over recent years. The
30 reasons for staff reductions vary from lowered reimbursements, realignment towards value-based
31 care, optimizing operational efficiency, and EHR-related costs. Organizations citing workforce
32 reductions related to excessive EHR costs have widely reported layoffs in the areas of general
33 operations, administration, revenue cycle and information technology, not in the positions of direct
34 patient care, such as physicians, advanced practice providers and nursing.¹⁷ In a recent statement
35 from Tenet Healthcare, leadership reported the intent to offshore more than 1,000 jobs, likely in the
36 area of corporate functions. Tenet leadership also expressly stated direct patient care employees,
37 such as physicians and nurses, would not be affected by the change.¹⁸

38
39 Reports of workforce reduction or job outsourcing specifically due to investments in EHR
40 technology exist, but are few. For example, in 2015 Lahey Health in Massachusetts lost \$21
41 million due to both lost business and expenses related to EHR implementation. The shortfall
42 prompted Lahey to lay off 130 people, which their CEO attributed partly to unplanned training
43 expenses connected to the EHR implementation.¹⁹ Also in 2015, Southcoast Hospital reduced its
44 workforce by one percent after expenses related to their EHR implementation exceeded what they
45 budgeted.²⁰

46
47 At the end of 2015, Brigham and Women’s Hospital reported lower financial gains than they had
48 originally anticipated with their EHR implementation after falling \$53 million short of the \$121
49 million expectation. These losses led to the subsequent elimination of 80 open positions and 20
50 staff members. Hospital president Betsy Nabel, MD, credited this in part to reduced
51 reimbursements from payers, high labor expenses among a largely unionized workforce, and high

1 capital costs, including those related to new facilities and their Epic implementation.²¹ The hospital
2 budgeted \$47 million for its implementation, but faced \$27 million in unexpected costs.²² In 2017,
3 even while finances were improving, Brigham and Women's was still facing a shortfall, forcing
4 them to commit to a \$50 million reduction in operating expenses, including offering a buyout to
5 more than 1,000 senior employees, including nursing staff.²³

6
7 In 2017, MD Anderson Cancer Center cut between 800 and 900 administrative positions after
8 experiencing significant losses after EHR implementation. MD Anderson also reported decreased
9 patient revenues resulting from EHR implementation but did not provide details on how the EHR
10 affected patient revenue.²⁴ However, they reported operating margins were net positive at fiscal
11 year-end 2017.²⁵ Wake Forest Baptist Medical Center and Moses Cone Memorial Hospital in North
12 Carolina have both experienced downgraded bond ratings and significant operating losses after
13 implementing EHR systems. They have both also cut staff to make up for these losses.²⁶

14
15 EHR implementation was undoubtedly a major factor in the financial circumstances that prompted
16 workforce reductions for these organizations. No one factor can be considered the sole catalyst,
17 however, as other significant costs, such as investments in new facilities, acquisition of other
18 practices, losses on investments, changing reimbursement rates, and increased operational costs
19 contributed to the budget holes that forced these hospitals to take cost-saving measures.²⁷ It is also
20 important to consider that hospitals and health systems reduce workforce for many reasons,
21 including forces entirely separate from EHR implementation, such as changing patient population,
22 specialty mix, or community needs.

23
24 Considerable costs, unbudgeted expenses, unforeseen training needs, and lost productivity due to
25 learning curves and unexpected downtime, are all known risks of implementing any new or
26 upgraded EHR.²⁸ Despite these accounts of losses and financial distress, some organizations
27 implement EHRs without issue and the long-term gains outweigh the short term financial losses. It
28 is also of note that the cases described above all involve the same EHR vendor product, therefore
29 generalizing these adverse experiences to all EHRs is not advised.

30
31 In addition to staff/workforce reductions driven by budgetary reasons, EHR implementation is
32 transforming the personnel needs and roles for healthcare organizations. A 2016 publication from
33 the North Carolina Medical Journal highlights the need for new jobs to assist before, during, and
34 after EHR implementation, such as technical software support staff, medical scribe specialists,
35 health care quality improvement specialists, and health care data scientists.²⁹ The most common
36 areas of staff reduction due to EHR implementation are in the areas of medical records,
37 transcription, and billing by replacing paper-related processes.^{29, 30}

38
39 An indirect cost of EHR implementation can be seen in the effects EHRs have on physicians in
40 practice, including increasing administrative burden, reducing face-to-face time with patients, and
41 even prompting reduction in work hours or leaving medicine altogether.³¹ Nearly 40 percent of
42 doctors list EHR design as one of the two things they find least satisfying about their jobs. Fifty-
43 six percent say the requirement has reduced efficiency and 66 percent report EHR use has reduced
44 the amount of time they spend with patients.³² In a 2017 survey, nearly one in five physicians
45 indicated they planned to reduce work hours within the following year. Dissatisfaction with the
46 EHR was an independent predictor of a physician's intent to leave practice or reduce clinical
47 hours.³¹

1 *Effects of EHR investment on the financial state of hospitals*
2
3 Implementing an EHR system is a significant undertaking for any practice or health care
4 organization. Adequate implementation can be costly and time consuming, resulting in many
5 organizations assuming a financial loss for a duration of time, a factor to be included in the capital
6 planning and budgetary process. Many eligible providers received incentive payments for the
7 adoption and use of EHRs,¹⁶ and the majority of eligible hospitals have demonstrated meaningful
8 use of certified HIT through participation in the EHR incentive program.¹
9
10 Common drivers and challenges contribute to the financial impact of EHR implementation. During
11 the implementation process, an increase in overall operational expenses occurs due to training of
12 personnel and the need for additional staff, consultants, and upfront product purchases. During this
13 time, the organization simultaneously experiences a reduction in productivity resulting in decreased
14 patient revenue. In addition to these two factors, some organizations discover they underestimated
15 the full costs of EHR implementation. For example, primary budgeting may only account for the
16 cost reported by the vendor, and the organization does not consider the expenses of staff, training,
17 infrastructure costs, and ongoing maintenance, resulting in significant unexpected costs.
18
19 Other areas of additional or unexpected costs include compliance with regulatory requirements,
20 credit challenges, and vendor deficiencies. With the introduction of meaningful use requirements
21 and government incentives, additional costs are often incurred to comply with regulatory
22 requirements.³³ Some hospitals have reported credit challenges in having adequate financial
23 reserves to support the initial capital investment required for implementing an EHR platform.³⁴
24 Other organizations have cited additional costs due to vendor shortcomings. For example,
25 Mountainview Medical Center in White Sulphur Springs, Montana filed a lawsuit against NextGen
26 for failing to install a compliant system on time.³⁴
27
28 As technology advances and regulatory requirements for data collection evolve, EHR
29 implementation and optimization projects are becoming more comprehensive. As a result, many
30 organizations have reported initial financial losses. However, recovery of net operating income and
31 a return to prior productivity levels occur within a short period of time. In 2015 and 2016, Partners
32 HealthCare, the site of the 2003 study previously discussed,¹⁰ implemented a new EHR system.
33 Partners HealthCare reported a decline of \$74.1 million in operating income for the last quarter of
34 2015 compared to the same quarter the prior year, due in part to the organization's EHR
35 implementation. By the second quarter of 2016, leadership reported gains in operating income,
36 despite simultaneously experiencing costs of \$18 million in EHR-related upgrades and expenses.³⁵
37
38 In the first quarter of 2016, Allegheny Health Network reported an operating loss of \$17.8 million
39 due to EHR implementation expenses, \$8.1 million more than the same period in the prior year. In
40 planning, the health system projected \$9.4 million in net losses for the first quarter of the year, yet
41 reported \$20.6 million. Leadership stated that in addition to decreased patient volumes, much of the
42 costs were attributed to a one-time investment in the EHR system.³⁵
43
44 While there is evidence that practices have incurred financial losses during EHR implementation
45 and optimization,³⁵ an extensive literature search does not identify an instance of any practice or
46 organization closing or changing their physician recruitment and retention practices specifically
47 due to exorbitant HIT/EHR costs. In addition, there is no requirement for medical staffs to report to
48 a state or national database why a medical staff member decides to resign, nor is there a
49 requirement to report the number of medical staff members and their membership status (e.g.,
50 active, courtesy, consulting, emeritus making it further difficult to quantify such effects.

1 *Long-term economic impacts*

2
3 There are very few studies available about the long-term economic impacts or effects of EHR
4 implementation. One 2015 study attempted to examine financial and clinical work day productivity
5 outcomes associated with the use of an EHR over nine years. The difference in net clinical revenue
6 per provider per year did not change significantly after EHR implementation. Charge capture, the
7 proportion of higher- and lower-level visit codes for new and established patients, and patient visits
8 per provider remained stable, and a total savings of \$188,951 in transcription costs occurred over a
9 4-year time period post-EHR implementation.³⁶ Another 2014 study evaluated the long-term
10 financial impact of EHR implementation in ambulatory practice. Practice productivity was tracked
11 over two years post-EHR implementation and demonstrated that the implementation was associated
12 with increased revenue, even after accounting for observed reduction in the number of patient
13 visits.³⁷ The AMA inquired with leadership at the American Hospital Association to determine if
14 they had additional research, content, or resources on the subject of EHR cost impacts on hospitals
15 and medical staffs, and they indicated they do not currently have any materials or resources
16 available.

17
18 CONCLUSION

19
20 It is evident from the literature that the costs, break-even point, and ROI all vary dramatically
21 depending on practice type, size, patient panel, specialty, and location. Given these disparate
22 representations, and the limited amount of recent, rigorous long-term study, it is difficult to
23 establish a universal ROI-focused narrative that makes a case that EHRs are either a wise or poor
24 long-term investment for hospitals or health systems, or any practice type. While there is anecdotal
25 evidence of physicians retiring early due to the implementation costs of EHR's there is little to no
26 data available to assert that investments in EHR technology will lead to subsequent reductions in
27 medical staff. Although EHR investments have contributed to temporary financial losses for some
28 organizations, there are no reports of hospitals or health systems forced to make sweeping
29 reductions in medical staff or completely closing explicitly due to investments in EHR technology.
30 One could speculate that organizations cutting or outsourcing non-direct patient care staff may not
31 be in a financial position to add more physicians to the staff, however there is no data to support
32 this. Although the impacts of staffing cuts inevitably affect care teams and patients, there is little to
33 no evidence that physicians have been included in the groups of workers laid off by organizations
34 that have made cuts.

35
36 A common theme throughout the available literature on cost-benefit analysis is that realizing the
37 benefits and achieving a positive ROI depend heavily on the engagement with and optimization of
38 the EHR as a tool for efficiency and process change. Simply installing the system without proper
39 training and feature customization will slow productivity and create new problems. Partial
40 implementation of an EHR, i.e., the continued use of paper for some record keeping, will inhibit
41 the benefits of implementing an EHR and reduce the total return on investment. Organizational
42 policies that promote EHR-enabled changes, such as EHR-supported clinic workflow, along with
43 more thorough research and planning for the implementation process, could facilitate the
44 realization of positive ROI and reduce the potential need for workforce reduction.

45
46 RECOMMENDATION

47
48 The Board of Trustees recommends that Policy D-225.974, "Impact of the High Capital Cost of
49 Hospital EHRs on the Medical Staff," be rescinded as having been fulfilled by this report and that
50 the remainder of this report be filed. (Rescind HOD Policy)

REFERENCES

1. The Office of the National Coordinator for Health Information Technology, Percent of Hospitals, By Type, that Possess Certified Health IT, H.I.Q.-S. #52, Editor. 2017.
2. The Office of the National Coordinator for Health Information Technology, Office-based Physician Electronic Health Record Adoption, H.I.Q.-S. #50, Editor. 2015.
3. Arndt, B.G., et al., Tethered to the EHR: Primary Care Physician Workload Assessment Using EHR Event Log Data and Time-Motion Observations. *Ann Fam Med*, 2017. 15(5): p. 419-426.
4. Sinsky, C., et al., Allocation of Physician Time in Ambulatory Practice: A Time and Motion Study in 4 SpecialtiesAllocation of Physician Time in Ambulatory Practice. *Ann Intern Med*, 2016. 165(11): p. 753-760.
5. McBride, M. Understanding the true costs of an EHR implementation plan. *Medical Economics*, 2012.
6. Murphy, K. What will your EHR implementation cost you? 2016.
7. Fleming, N.S., et al., The Financial And Nonfinancial Costs Of Implementing Electronic Health Records In Primary Care Practices. *Health Affairs*, 2011. 30(3): p. 481-489.
8. Cohen, J.K. 10 EHR implementations with the biggest price tags in 2017. Becker's Health IT & CIO Report, 2017.
9. Becker's Health Information Technology Unpacking hospitals' EHR implementation costs: What's behind the million-dollar price tags? 2016.
10. Wang, S.J., et al., A cost-benefit analysis of electronic medical records in primary care. *Am J Med*, 2003. 114(5): p. 397-403.
11. Miller, R., et al., The Value Of Electronic Health Records In Solo Or Small Group Practices. *Health Affairs*, 2005. 24(5): p. 1127-1137.
12. Adler-Milstein, J., C.E. Green, and D.W. Bates, A Survey Analysis Suggests That Electronic Health Records Will Yield Revenue Gains For Some Practices And Losses For Many. *Health Affairs*, 2013. 32(3): p. 562-570.
13. Jang, Y., M.A. Lortie, and S. Sanche, Return on investment in electronic health records in primary care practices: a mixed-methods study. *JMIR Med Inform*, 2014. 2(2): p. e25-e25.
14. KPMG, Beyond Implementation: Optimizing EHRs to Realize Results. 2017.
15. Siwicki, B. EHR optimization leads to 53% increase in cash collections at Rangely Hospital. 2018.
16. Centers for Medicare and Medicaid Services, Promoting Interoperability Program Active Registrations October 2018. 2018.
17. LaPointe, J. Hospitals Target Labor Costs, Layoffs to Reduce Healthcare Costs. Practice Management News, 2018.
18. Gooch, K. Tenet looks at offshoring more than 1,000 healthcare jobs. 2019.
19. Becker's Hospital Review, Part of Lahey Health layoffs due to cost of EHR rollout. 2015.
20. Heath, S. Epic EHR Implementation Causes Financial Issues at MA Hospital. 2016.
21. Pearl, R. Why Major Hospitals Are Losing Money By The Millions. Forbes, 2017.
22. Murphy, K. Epic EHR Implementation Costs Brigham and Women's Hospital. 2015.
23. Winslow, R. Not even the mattress pads were spared: An inside look at a top hospital's struggle to cut costs. 2017.
24. Castellucci, M. MD Anderson Cancer Center to cut 900 jobs due to losses from EHR rollout. 2017.
25. Ackerman, T. MD Anderson back in the black for the fiscal year. Houston Chronicle, 2017.
26. Bresnick, J. Another NC hospital falls to Epic EHR implementation costs. 2013.
27. Partners Healthcare, Partners HealthCare Reports 2017 Financial Results. 2017: Boston.
28. Ajami, S. and T. Bagheri-Tadi, Barriers for Adopting Electronic Health Records (EHRs) by Physicians. *Acta informatica medica : AIM : journal of the Society for Medical Informatics of*

Bosnia & Herzegovina : casopis Drustva za medicinsku informatiku BiH, 2013. 21(2): p. 129-134.

- 29. Zeng, X., The Impacts of Electronic Health Record Implementation on the Health Care Workforce. *N C Med J*, 2016. 77(2): p. 112-4.
- 30. Lynn, J. EHR Benefit – Eliminate Staff. 2013.
- 31. Sinsky, C.A., et al., Professional Satisfaction and the Career Plans of US Physicians. *Mayo Clin Proc*, 2017. 92(11): p. 1625-1635.
- 32. The Physicians Foundation, 2018 Survey of America's Physicians. 2018, The Physicians Foundation.
- 33. Blumenthal, D. and M. Tavenner, The “Meaningful Use” Regulation for Electronic Health Records. *N Engl J Med*, 2010. 363(6): p. 501-504.
- 34. Becker's Hospital Review, 7 Negative Outcomes From EHR Implementations. 2014.
- 35. Jayanthi, A. and A. Ellison 8 hospitals' finances hurt by EHR costs. 2016.
- 36. Lim, M.C., et al., The Long-Term Financial and Clinical Impact of an Electronic Health Record on an Academic Ophthalmology Practice. *J Ophthalmol*, 2015. 2015: p. 7.
- 37. Howley, M.J., et al., The long-term financial impact of electronic health record implementation. *J Am Med Inform Assoc*, 2015. 22(2): p. 443-52.