Evidence Synthesis Program

# Physician Productivity in Specialty Care

June 2025

U.S. Department of Veterans Affairs
Veterans Health Administration
*Health Systems Research*

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# *Appendices*

# SEARCH STRATEGIES

## MEDLINE (OVID)

| # | Search Statement | Results |
|---|---|---|
| 1 | ((clinician* or doctor* or physician* or practitioner* or provider*) adj3 (effort* or productivit* or workload* or bookability or (bookable adj1 (hour* or time)) or clinical encounter* or ((labor or labour or time) adj3 (map or mapping* or maps)) or (valu* adj2 work*))).ti,ab,kf. | 6178 |
| 2 | exp Models, Economic/ or Models, Statistical/ or Models, Theoretical/ or (benchmark* or evaluat* or model* or measur* or metric*).ti,ab,kf. | 111091630 |
| 3 | Relative Value Scale/ or ((relative value adj1 (scale* or schedule* or unit*)) or rvu or rvus or wrvu or wrvus).ti,ab,kf. | 2927 |
| 4 | 2 or 3 | 11093335 |
| 5 | 1 and 4 | 3003 |
| | ***Total*** | 3003 |
| | ***Total after deduplication*** | 6300 |

*Search date:* 12/10/2024

## COCHRANE (WILEY)

| # | Search Statement | Results |
|---|---|---|
| 1 | ((clinician* or doctor* or physician* or practitioner* or provider*) NEAR/3 (effort* or productivit* or workload* or bookability or (bookable NEAR/1 (hour* or time)) or "clinical encounter" or "clinical encounters" or ((labor or labour or time) NEAR/3 (map or mapping* or maps)) or (valu* NEAR/2 work*))):ti,ab | 438 |
| 2 | MeSH descriptor: [Models, Economic] explode all trees | 690 |
| 3 | MeSH descriptor: [Models, Statistical] this term only | 2310 |
| 4 | MeSH descriptor: [Models, Theoretical] this term only | 1152 |
| 5 | (benchmark* or evaluat* or model* or measur* or metric*):ti,ab | 1099713 |
| 6 | {or #2-#5} | 1100372 |
| 7 | MeSH descriptor: [Relative Value Scales] this term only | 11 |
| 8 | ((relative value NEAR/1 (scale* or schedule* or unit*)) or rvu or rvus or wrvu or wrvus):ti,ab | 55 |
| 9 | #7 or #8 | 59 |
| 10 | #6 or #8 | 1100387 |
| 11 | #1 and #11 | 308 |
| | ***Total*** | 308 |
| | ***Total after deduplication*** | 6300 |

*Search date:* 12/10/2024

## SCOPUS (ELSEVIER)

| # | Search Statement | Results |
|---|---|---|
| 1 | TITLE-ABS-KEY((clinician* or doctor* or physician* or practitioner* or provider*) adj3 (effort* or productivit* or workload* or bookability or (bookable adj1 (hour* or time)) or clinical encounter* or ((labor or labour or time) adj3 (map or mapping* or maps)) or (valu* adj2 work*))) | 12806 |
| 2 | TITLE-ABS-KEY(benchmark* or evaluat* or model* or measur* or metric*) | 34280209 |
| 3 | TITLE-ABS-KEY((“relative value” adj1 (scale* or schedule* or unit*)) or rvu or rvus or wrvu or wrvus) | 3293 |
| 4 | 2 or 3 | 34281991 |
| 5 | 1 and 4 | 5909 |
| | ***Total*** | 5909 |
| | ***Total after deduplication*** | 6300 |

*Search date:* 12/10/2024

# STUDIES EXCLUDED DURING FULL-TEXT SCREENING

| Citation | Exclude Reason |
|---|---|
| How is physician productivity measured? Managed Care Interface. 2002;15(9):62-63. | Wrong publication type |
| Encourage desired physician behavior, improve productivity through performance measures. Healthcare Strateg Manage. 2006;24(8):10-11. | Wrong publication type |
| Abecassis M, Pearson T. Fee-for-value and wRVU-based physician productivity-an emerging paradox. American journal of transplantation : official journal of the American Society of Transplantation and the American Society of Transplant Surgeons. 2015;15(3):579-80. doi:https://dx.doi.org/10.1111/ajt.13112 | Wrong publication type |
| Adida E, Dai T. Impact of Physician Payment Scheme on Diagnostic Effort and Testing. Manage Sci. 2024;70(8):5408-5425. doi:10.1287/mnsc.2023.4937 | Wrong outcomes |
| Alexandraki I, Palacio C, House J, Catalano C, Mooradian AD. Resource-based relative value scale analysis between teaching and nonteaching hospitalist services. The health care manager. 2009;28(1):81-5. doi:https://dx.doi.org/10.1097/HCM.0b013e318196de91 | Wrong outcomes |
| Alies-Patin A, Bai-Grenier F, Debeugny G, Khelifa A. Methodological proposals for overhauling the surgical part of the physician's procedural index. J ECON MED. 1995;13(2):75-82. | Non-English |
| Andreae MC, Freed GL. A new paradigm in academic health centers: productivity-based physician compensation. Medical group management journal. 2001;48(3):44-54 | Wrong patient population |
| Andreae MC, Freed GL. Using a productivity-based physician compensation program at an academic health center: a case study. Academic medicine : journal of the Association of American Medical Colleges. 2002;77(9):894-9. doi:https://dx.doi.org/10.1097/00001888-200209000-00019 | Wrong patient population |
| Anjum O, Yadav K, Chhabra S, et al. Definitions and factors associated with emergency physician productivity: a scoping review. CJEM. 2023;25(4):314-325. doi:https://dx.doi.org/10.1007/s43678-023-00479-1 | Wrong publication type |
| Anonymous. Boost physician productivity with performance data. Data strategies & benchmarks : the monthly advisory for health care executives. 1997;1(2):17-21. | Wrong publication type |
| Anonymous. Harness contracting clout by tracking physician productivity. Capitation management report. 1997;4(12):194-7. | No full text available |
| Arndt B, Tuan W-J, White J, Schumacher J. Panel workload assessment in US primary care: accounting for non-face-to-face panel management activities. Journal of the American Board of Family Medicine : JABFM. 2014;27(4):530-7. doi:https://dx.doi.org/10.3122/jabfm.2014.04.130236 | Wrong outcomes |
| Bansal VV, Witmer HDD, Childers CP, Su DG, Turaga KK. When Benchmarks Fail Us: A Case Study in Cytoreductive Surgery. Annals of surgical oncology. 2024;(b9r, 9420840)doi:https://dx.doi.org/10.1245/s10434-024-16191-y | Wrong outcomes |
| Baymon DE, Shappell E, Park YS, et al. Measuring Emergency Department Workload Perception Using Electronic Medical Record Measures of Patient Volume and Acuity. The Journal of emergency medicine. 2024;66(3):e374-e380. doi:https://dx.doi.org/10.1016/j.jemermed.2023.10.004 | Wrong outcomes |

| Citation | Exclude Reason |
|---|---|
| Becker ER, Hall K. Physician services in an academic neurology department: using the resource-based relative-value scale to examine physician activities. Journal of health care finance. 2001;27(4):79-91. | Wrong outcomes |
| Benda NC, Blumenthal HJ, Hettinger AZ, et al. Human Factors Design in the Clinical Environment: Development and Assessment of an Interface for Visualizing Emergency Medicine Clinician Workload. IISE Trans Occup Ergon Hum Factors. 2018;6(3-4):225-237. doi:10.1080/24725838.2018.1522392 | Wrong outcomes |
| Bertrand F, Martinez P, Thiercelin D, et al. Physician's workload in the emergency department: Quantitative or qualitative problem? About the emergency physicians's serenity. Reanim Urgences. 2000;9(7):492-497. doi:10.1016/s1164-6756(00)90054-9 | Non-English |
| Blalock J, Mackowiak PA. A resource-allocation model to enhance productivity of academic physicians. Academic medicine : journal of the Association of American Medical Colleges. 1998;73(10):1062-6. doi:https://dx.doi.org/10.1097/00001888-199810000-00013 | Wrong outcomes |
| Bonfim D, Pereira MJB, Pierantoni CR, Haddad AE, Gaidzinski RR. Tool to measure workload of health professionals in Primary Health Care: development and validation. Revista da Escola de Enfermagem da U S P. 2015;49 Spec No(rss, 0242726):25-34. doi:https://dx.doi.org/10.1590/S0080-623420150000800004 | Wrong patient population |
| Burden M, Gundareddy VP, Kauffman R, et al. Assessing the impact of workload and clinician experience on patient throughput: A multicenter study. Journal of hospital medicine. 2024;(101271025)doi:https://dx.doi.org/10.1002/jhm.13555 | Wrong outcomes |
| Calvitti A, Hochheiser H, Ashfaq S, et al. Physician activity during outpatient visits and subjective workload. Journal of biomedical informatics. 2017;69(100970413, d2m):135-149. doi:https://dx.doi.org/10.1016/j.jbi.2017.03.011 | Wrong outcomes |
| Camiat F, Restrepo MI, Chauny J-M, Lahrichi N, Rousseau L-M. Productivity-driven physician scheduling in emergency departments. Health systems (Basingstoke, England). 2019;10(2):104-117. doi:https://dx.doi.org/10.1080/20476965.2019.1666036 | Wrong outcomes |
| Carlson ER. Academic Relative Value Units: A Proposal for Faculty Development in Oral and Maxillofacial Surgery. Journal of oral and maxillofacial surgery : official journal of the American Association of Oral and Maxillofacial Surgeons. 2021;79(1):36.e1-36.e13. doi:https://dx.doi.org/10.1016/j.joms.2020.09.036 | Wrong outcomes |
| Chakiryan NH, Jiang DD, Gillis KA, Chen Y, Acevedo AM, Sajadi KP. Relative Value Units do Not Adequately Account for Operative Time of Urological Surgery. The Journal of urology. 2020;203(5):1003-1007. doi:https://dx.doi.org/10.1097/JU.0000000000000619 | Wrong outcomes |
| Chandrasekar T, Han TM, Glick L, et al. Setting the Standards: Examining Research Productivity Among Academic Urologists in the USA and Canada in 2019. Eur Urol Focus. 2021;7(2):489-496. doi:10.1016/j.euf.2020.02.003 | Wrong outcomes |
| Coleman DL, Moran E, Serfilippi D, et al. Measuring physicians' productivity in a Veterans Affairs Medical Center. *Acad Med*. 2003;78(7):682-689. doi:10.1097/00001888-200307000-00007 | Wrong outcomes |
| Collier DA, Collier CE, Kelly TM. Benchmarking physician performance, Part 1. The Journal of medical practice management : MPM. 2006;21(4):185-9. | Wrong publication type |

| Citation | Exclude Reason |
|---|---|
| Conlon M, Tharani Z. The implementation of a physician workload system in an academic health care setting: The Physician Activity Information System (PhAIS). Br Columbia Med J. 2008;50(10):565-570. | Wrong intervention |
| Conrad DA, Sales A, Liang S-Y, et al. The impact of financial incentives on physician productivity in medical groups. Health services research. 2002;37(4):885-906. doi:https://dx.doi.org/10.1034/j.1600-0560.2002.57.x | Wrong intervention |
| Das J, Sohnesen TP. Variations in doctor effort: evidence from Paraguay. Health affairs (Project Hope). 2007;26(3):w324-37. doi:https://dx.doi.org/10.1377/hlthaff.26.3.w324 | Wrong outcomes |
| Davis A, Hardy CT. New compensation model improves physician productivity. Healthcare financial management : journal of the Healthcare Financial Management Association. 1999;53(7):46-9. | Wrong outcomes |
| Davis PL. Assessing the potential versus the actual earnings of academic radiologists: effects of unequal duty service assignments. Academic radiology. 2001;8(8):782-91. doi:https://dx.doi.org/10.1016/S1076-6332(03)80587-1 | Wrong patient population |
| Dawson EL, Speelman C. Productivity measurement in psychology and neuropsychology: Existing standards and alternative suggestions. The Clinical neuropsychologist. 2023;37(8):1569-1583. doi:https://dx.doi.org/10.1080/13854046.2023.2192419 | Wrong publication type |
| Deguchi JJ, Inui TS, Martin DP. Measuring provider productivity in ambulatory care. The Journal of ambulatory care management. 1984;7(2):29-38. doi:https://dx.doi.org/10.1097/00004479-198405000-00006 | Wrong intervention |
| Dent T. Masters in medicine: Part III. Performance measurements of primary care physicians in managed care. Dis Mon. 1998;44(8):400-420. doi:10.1016/S0011-5029(98)90007-4 | Wrong publication type |
| Didzbalis CJ, Avery Cohen D, Herzog I, Park J, Weisberger J, Lee ES. The Relative Citation Ratio: A Modern Approach to Assessing Academic Productivity within Plastic Surgery. Plastic and reconstructive surgery Global open. 2022;10(11):e4564. doi:https://dx.doi.org/10.1097/GOX.0000000000004564 | Wrong outcomes |
| Dubinsky I. Emergency physician workload modeling. CJEM. 2012;14(4):215-20. doi:https://dx.doi.org/10.2310/8000.2012.120532 | Wrong patient population |
| Dunn D, Hsiao WC, Ketcham TR, Braun P. A Method for Estimating the Preservice and Postservice Work of Physicians' Services. JAMA. 1988;260(16):2371-2378. doi:10.1001/jama.1988.03410160045006 | Wrong outcomes |
| Dupree JM, Coward RM, Hsieh T-C, et al. The Impact of Physician Productivity Models on Access to Subspecialty Care: A White Paper From the Society for the Study of Male Reproduction and the Society for Male Reproduction and Urology. Urology. 2021;153(wsy, 0366151):28-34. doi:https://dx.doi.org/10.1016/j.urology.2021.01.016 | Wrong publication type |
| Duszak R, Jr., Muroff LR. Measuring and managing radiologist productivity, part 2: beyond the clinical numbers. Journal of the American College of Radiology : JACR. 2010;7(7):482-9. doi:https://dx.doi.org/10.1016/j.jacr.2010.01.025 | Wrong publication type |
| Duszak R, Jr., Muroff LR. Measuring and managing radiologist productivity, part 1: clinical metrics and benchmarks. Journal of the American College of Radiology : JACR. 2010;7(6):452-8. doi:https://dx.doi.org/10.1016/j.jacr.2010.01.026 | Wrong publication type |

| Citation | Exclude Reason |
|---|---|
| Ekeroma AJ, Shulruf B, McCowan L, Hill AG, Kenealy T. Development and use of a research productivity assessment tool for clinicians in low-resource settings in the Pacific Islands: A Delphi study. Health Res Policy Syst. 2016;14(1)doi:10.1186/s12961-016-0077-4 | Wrong outcomes |
| Erus B, Hatipoglu O. Physician payment schemes and physician productivity: Analysis of Turkish healthcare reforms. Health policy (Amsterdam, Netherlands). 2017;121(5):553-557. doi:https://dx.doi.org/10.1016/j.healthpol.2017.02.012 | Wrong outcomes |
| Evans Iii JH, Kim K, Nagarajan NJ, Patro S. Nonfinancial performance measures and physician compensation. J Manage Account Res. 2010;22(1):31-56. doi:10.2308/jmar.2010.22.1.31 | Wrong publication type |
| Fetter RB, Averill RF, Lichtenstein JL, Freeman JL. Ambulatory visit groups: A framework for measuring productivity in ambulatory care. *HEALTH SERV RES*. 1984;19(4):415-437. | Wrong publication type |
| Filler G, Burkoski V, Tithecott G. Measuring physicians' productivity: a three-year study to evaluate a new remuneration system. Academic medicine : journal of the Association of American Medical Colleges. 2014;89(1):144-52. doi:https://dx.doi.org/10.1097/ACM.0000000000000058 | Wrong patient population |
| Fishbein D, Nambiar S, McKenzie K, et al. Objective measures of workload in healthcare: a narrative review. International journal of health care quality assurance. 2019;33(1):1-17. doi:https://dx.doi.org/10.1108/IJHCQA-12-2018-0288 | Wrong publication type |
| Fisher C. Multifactor productivity in physicians' offices: an exploratory analysis. Health care financing review. 2008;29(2):15-32. | Wrong publication type |
| Forootan S, Hajebrahimi S, Janati A, Najafi B, Asghari-Jafarabadi M. Development of a local model for measuring the work of surgeons. Turk J Surg. 2021;37(4):371-378. doi:10.47717/turkjsurg.2021.5473 | Wrong patient population |
| Freeman P. Measuring emergency physician productivity and work patterns. Emergency medicine Australasia : EMA. 2023;35(4):687-690. doi:https://dx.doi.org/10.1111/1742-6723.14208 | Wrong publication type |
| Friedman EL, Guidi TU. Measuring Physician Productivity: Taking the Pulse of a Practice. Oncol Issues. 2005;20(1):38-41. doi:10.1080/10463356.2005.11883234 | Wrong publication type |
| Gan ZS, Wood CM, Hayon S, et al. Correlation of Relative Value Units With Surgical Complexity and Physician Workload in Urology. Urology. 2020;139(wsy, 0366151):71-77. doi:https://dx.doi.org/10.1016/j.urology.2019.12.044 | Wrong outcomes |
| Gao J, Moran E, Schwartz A, Ruser C. Case-mix for assessing primary care value (CPCV). *Health Serv Manage Res*. 2020;33(4):200-206. doi:10.1177/0951484820931063 | Wrong outcomes |
| Giacoma T, Ayvaci MUS, Gaston RS, Mejia A, Tanriover B. Transplant physician and surgeon compensation: A sample framework accounting for nonbillable and value-based work. American journal of transplantation : official journal of the American Society of Transplantation and the American Society of Transplant Surgeons. 2020;20(3):641-652. doi:https://dx.doi.org/10.1111/ajt.15625 | Wrong publication type |
| Glass KP, Anderson JR. Relative value units and productivity: Part 2 of 4. The Journal of medical practice management : MPM. 2002;17(6):285-90. | Wrong publication type |
| Greenfield AR. Physician productivity: a managerial challenge. The Journal of ambulatory care management. 1989;12(1):6-10. doi:https://dx.doi.org/10.1097/00004479-198902000-00004 | Wrong publication type |

| Citation | Exclude Reason |
|---|---|
| Grogan D, Reddy V, Gupta A, Chang Y-F, Fields D, Agarwal N. Trends in Academic Spine Neurosurgeon Productivity as Measured by the Relative Citation Ratio. World neurosurgery. 2021;147(101528275):e40-e46. doi:https://dx.doi.org/10.1016/j.wneu.2020.11.097 | Wrong outcomes |
| Groningen NV, Prasad PA, Najafi N, Rajkomar A, Khanna RR, Fang MC. Electronic Order Volume as a Meaningful Component in Estimating Patient Complexity and Resident Physician Workload. Journal of hospital medicine. 2018;13(12):829-835. doi:https://dx.doi.org/10.12788/jhm.3069 | Wrong outcomes |
| Gui XH, Wang HB, Liu H, Yang YF. Construction of Incentive Salary Model Based on Family Doctor Services System. Chin Gen Pract. 2018;21(25):3038-3043. doi:10.12114/j.issn.1007-9572.2018.25.003 | Non-English |
| Haeuser L, Cone EB, Cole AP, Marchese M, Trinh Q-D. Are work relative value units correlated with operative duration of common surgical procedures? The American journal of managed care. 2022;28(4):148-151. doi:https://dx.doi.org/10.37765/ajmc.2022.88858 | Wrong outcomes |
| Haidar YM, Moshtaghi O, Mahboubi H, et al. Association Between Electronic Medical Record Implementation and Otolaryngologist Productivity in the Ambulatory Setting. JAMA otolaryngology-- head & neck surgery. 2017;143(1):20-24. doi:https://dx.doi.org/10.1001/jamaoto.2016.2528 | Wrong intervention |
| Hao J, Yao H, Kong L, Liu Y. The work relative value estimation assessment in China: an empirical research for common surgical procedures. Frontiers in public health. 2024;12(101616579):1385616. doi:https://dx.doi.org/10.3389/fpubh.2024.1385616 | Wrong outcomes |
| Harolds JA. Productivity of nuclear medicine physicians and radiologists. Clin Nucl Med. 2011;36(1):32-33. doi:10.1097/RLU.0b013e3181ffecb6 | Wrong publication type |
| Hayon S, Deal A, Tan H-J, et al. Is the relative value of surgeon effort equal across surgical specialties? Surgery. 2020;168(3):365-370. doi:https://dx.doi.org/10.1016/j.surg.2020.04.018 | Wrong patient population |
| Henderson WS. Benchmarking the neurology practice. Neurologic clinics. 2010;28(2):365-84. doi:https://dx.doi.org/10.1016/j.ncl.2009.11.003 | Wrong publication type |
| Hickey M, Ichter JT. Promoting physician productivity through a variable compensation system. Healthcare financial management : journal of the Healthcare Financial Management Association. 1997;51(8):38-40. | Wrong outcomes |
| Hill RG, Jr., Sears LM, Melanson SW. 4000 clicks: a productivity analysis of electronic medical records in a community hospital ED. The American journal of emergency medicine. 2013;31(11):1591-4. doi:https://dx.doi.org/10.1016/j.ajem.2013.06.028 | Wrong intervention |
| Howell TG, Jr. Primary Care Productivity and Patient Satisfaction in Community Practice: What is the Relationship? Patient Exp J. 2024;11(2):27-35. doi:10.35680/2372-0247.1948 | Wrong outcomes |
| Hysong SJ, Amspoker AB, Petersen LA. A Novel Method for Assessing Task Complexity in Outpatient Clinical-Performance Measures. J Gen Intern Med. 2016;31:28-35. doi:10.1007/s11606-015-3568-z | Wrong outcomes |
| Innes GD, Stenstrom R, Grafstein E, Christenson JM. Prospective time study derivation of emergency physician workload predictors. CJEM. 2005;7(5):299-308. doi:https://dx.doi.org/10.1017/s1481803500014482 | Wrong patient population |
| Jacob J, Wan F, Jin A. Is telemedicine worth the effort? A study on the impact of effort cost on healthcare platform with heterogeneous preferences. Comput Ind Eng. 2024;188doi:10.1016/j.cie.2023.109854 | Wrong outcomes |

| Citation | Exclude Reason |
|---|---|
| Jacobs JP, Lahey SJ, Nichols FC, et al. How Is Physician Work Valued? The Annals of thoracic surgery. 2017;103(2):373-380. doi:https://dx.doi.org/10.1016/j.athoracsur.2016.11.059 | Wrong publication type |
| Jiang Y, Huang Y-L, Watral A, Blocker RC, Rushlow DR. Predicting Provider Workload Using Predicted Patient Risk Score and Social Determinants of Health in Primary Care Setting. Applied clinical informatics. 2024;15(3):511-527. doi:https://dx.doi.org/10.1055/s-0044-1787647 | Wrong outcomes |
| Johannessen KA, Kittelsen SAC, Hagen TP. Assessing physician productivity following Norwegian hospital reform: A panel and data envelopment analysis. Social science & medicine (1982). 2017;175(ut9, 8303205):117-126. doi:https://dx.doi.org/10.1016/j.socscimed.2017.01.008 | Wrong outcomes |
| Johnson SE, Newton WP. Resource-based relative value units: a primer for academic family physicians. Family medicine. 2002;34(3):172-6. | Wrong publication type |
| Johnsson J. Software measures provider productivity through clinical data. Contract healthcare. 1988;(9883667, dr6):26-7. | No full text available |
| Joseph JW, Davis S, Wilker EH, et al. Modelling attending physician productivity in the emergency department: a multicentre study. Emergency medicine journal : EMJ. 2018;35(5):317-322. doi:https://dx.doi.org/10.1136/emermed-2017-207194 | Wrong intervention |
| Kachhal SK, Bronken T, McCarthy B, Schramm W, Isken N. Performance measurement for primary care physicians. IIE; 1996:179-188. | No full text available |
| Kahan JP, Morton SC, Farris HH, Kominski GF, Donovan AJ. Panel processes for revising relative values of physician work a pilot study. Med Care. 1994;32(11):1069-1085. doi:10.1097/00005650-199411000-00001 | Wrong publication type |
| Kalmar CL, Patel VA, Golinko MS. Surgical Complexity and Physician Workload in Craniofacial Surgery: Do RVUs Need to be Adjusted? The Journal of craniofacial surgery. 2024;(a3j, 9010410)doi:https://dx.doi.org/10.1097/SCS.0000000000009989 | Wrong outcomes |
| Kantarevic J, Kralj B, Weinkauf D. Enhanced fee-for-service model and physician productivity: evidence from Family Health Groups in Ontario. Journal of health economics. 2011;30(1):99-111. doi:https://dx.doi.org/10.1016/j.jhealeco.2010.10.005 | Wrong outcomes |
| Kaplan PE, Granger CV, Pease WS, Arnett JA, Huba JC. Development of an academic productivity scale for departments of physical medicine and rehabilitation. Archives of physical medicine and rehabilitation. 1997;78(9):938-41. doi:https://dx.doi.org/10.1016/s0003-9993(97)90053-8 | Wrong outcomes |
| Kaplan SH, Griffith JL, Price LL, Pawlson LG, Greenfield S. Improving the reliability of physician performance assessment: identifying the "physician effect" on quality and creating composite measures. Medical care. 2009;47(4):378-87. doi:https://dx.doi.org/10.1097/MLR.0b013e31818dce07 | Wrong outcomes |
| Kee F, Wilson RH, Harper C, et al. Influence of hospital and clinician workload on survival from colorectal cancer: cohort study. BMJ (Clinical research ed). 1999;318(7195):1381-5. doi:https://dx.doi.org/10.1136/bmj.318.7195.1381 | Wrong outcomes |
| Kentros C, Barbato C. Using normalized RVU reporting to evaluate physician productivity. Healthcare financial management : journal of the Healthcare Financial Management Association. 2013;67(8):98-105. | Wrong patient population |
| Khalifa M. Developing an Emergency Physician Productivity Index Using Descriptive Health Analytics. Studies in health technology and informatics. 2015;213(ck1, 9214582):167-70. | Wrong patient population |

| Citation | Exclude Reason |
|---|---|
| Kidd VD, Liu JH, Reamer-Yu A, Wang JH, Deng M. The development of a visual dashboard report to assess physician assistant and nurse practitioner financial and clinical productivity. BMC health services research. 2022;22(1):882. doi:https://dx.doi.org/10.1186/s12913-022-08216-7 | Wrong patient population |
| Kimbell LJ, Lorant JH. Physician productivity and returns to scale. Health services research. 1977;12(4):367-79. | Wrong outcomes |
| King JJC, Powell-Jackson T, Hargreaves J, Makungu C, Goodman C. Does increased provider effort improve quality of care? Evidence from a standardised patient study on correct and unnecessary treatment. BMC health services research. 2023;23(1):190. doi:https://dx.doi.org/10.1186/s12913-023-09149-5 | Wrong outcomes |
| Lagasse P, Jr. Physician productivity measurement, methodology and implementation. Journal of the Society for Health Systems. 1996;5(2):41-9. | Wrong patient population |
| Lagasse P. Physician productivity measurement, application & results. IIE; 1996:198-207. | No full text available |
| Lamba R, Schapira MM, Singh S, Fletcher KE. Defining and measuring the effort needed for inpatient medicine work. Journal of hospital medicine. 2012;7(5):426-30. doi:https://dx.doi.org/10.1002/jhm.1004 | Wrong patient population |
| Landauer TE, Gans DN, Brierly Golin C. Medical practice management trends: New methods of measuring physician productivity. J MED PRACT MANAGE. 1988;3(4):245-248. | Wrong publication type |
| Lazarus SS, Krill MA, Gans DN, Bergstrom A. Physician productivity measurement and comparison. The Journal of ambulatory care management. 1989;12(1):38-51. doi:https://dx.doi.org/10.1097/00004479-198902000-00007 | Wrong publication type |
| Ledoux B, Riou F, Jarno P, Pinel JF, Le Beux P, Chaperon J. Measuring physician's workload when caring for stroke patients in the neurological ward of a University Hospital. J Econ Med. 2003;21(4):239-251. | Non-English |
| Lee S, Bain PA, Musa AJ, Li J. A Markov chain model for analysis of physician workflow in primary care clinics. Health care management science. 2021;24(1):72-91. doi:https://dx.doi.org/10.1007/s10729-020-09517-1 | Wrong outcomes |
| Leung S. Is it Right to Measure the Productivity of Senior Clinician/Educators by Relative Value Units? Journal of graduate medical education. 2011;3(1):9. doi:https://dx.doi.org/10.4300/JGME-D-10-00214.1 | Wrong publication type |
| Levin LS, Gustave L. Aligning incentives in health care: physician practice and health system partnership. Clinical orthopaedics and related research. 2013;471(6):1824-31. doi:https://dx.doi.org/10.1007/s11999-012-2775-8 | Wrong patient population |
| Levin S, France DJ, Hemphill R, et al. Tracking workload in the emergency department. Human factors. 2006;48(3):526-39. doi:https://dx.doi.org/10.1518/001872006778606903 | Wrong outcomes |
| Li D, Hu Y, Liu S, et al. Developing an Integrated Evaluation Model for Physician Comprehensive Workload Tethered to Outpatient Practice: An Empirical Study From China. Frontiers in public health. 2022;10(101616579):847613. doi:https://dx.doi.org/10.3389/fpubh.2022.847613 | Wrong outcomes |
| Liu CC. Measuring the productivity of physicians and evaluating the factors that influence such productivity in Taiwan. J Med Sci (Pakistan). 2006;6(4):577-584. doi:10.3923/jms.2006.577.584 | Wrong outcomes |
| Lovett KM, Liang BA. Quality care opportunities: refining physician performance measurement in ambulatory care. The American journal of managed care. 2012;18(6):e212-6. | Wrong publication type |

| Citation | Exclude Reason |
|---|---|
| Maia Barreto JO. Pay-for-performance in health care services: A review of the best evidence available. Cienc Saude Coletiva. 2015;20(5):1497-1514. doi:10.1590/1413-81232015205.01652014 | Non-English |
| Malouin JM. Physician productivity and reimbursement. Clin Fam Pract. 2003;5(4):991-1007. doi:10.1016/S1522-5720(03)00082-5 | Wrong publication type |
| Manning C. Optimizing physician productivity in an employed physician model. Curr Orthop Pract. 2017;28(4):444-445. doi:10.1097/BCO.0000000000000533 | Wrong publication type |
| Mayer AM, Dahlin C, Seidenschmidt L, et al. Palliative Care: A Survey of Program Benchmarking for Productivity and Compensation. The American journal of hospice & palliative care. 2022;39(11):1298-1303. doi:https://dx.doi.org/10.1177/10499091221077878 | Wrong patient population |
| McNassor R, Grits D, Said TM, Burkhart RJ, Acuna AJ, Kamath AF. Correlation of Relative Value Units With Surgical Complexity and Physician Workload: A Contemporary Nationwide Analysis of Orthopaedic Procedures. The Journal of the American Academy of Orthopaedic Surgeons. 2023;31(8):413-420. doi:https://dx.doi.org/10.5435/JAAOS-D-22-00866 | Wrong outcomes |
| Meeks SL, Shang MH, Willoughby TR, Kelly P, Shah AP. Research productivity of radiation therapy physics faculty in the United States. Journal of applied clinical medical physics. 2021;22(11):185-195. doi:https://dx.doi.org/10.1002/acm2.13456 | Wrong setting |
| Melnick ER, Fong A, Nath B, et al. Analysis of Electronic Health Record Use and Clinical Productivity and Their Association With Physician Turnover. JAMA network open. 2021;4(10):e2128790. doi:https://dx.doi.org/10.1001/jamanetworkopen.2021.28790 | Wrong intervention |
| Melnick ER, Harry E, Sinsky CA, et al. Perceived Electronic Health Record Usability as a Predictor of Task Load and Burnout Among US Physicians: Mediation Analysis. Journal of medical Internet research. 2020;22(12):e23382. doi:https://dx.doi.org/10.2196/23382 | Wrong outcomes |
| Menachemi N, Yeager VA, Welty E, Manzella B. Are physician productivity and quality of care related? Journal for healthcare quality : official publication of the National Association for Healthcare Quality. 2015;37(2):93-101. doi:https://dx.doi.org/10.1111/jhq.12038 | Wrong patient population |
| Michtalik HJ, Pronovost PJ, Marsteller JA, Spetz J, Brotman DJ. Developing a model for attending physician workload and outcomes. JAMA internal medicine. 2013;173(11):1026-8. doi:https://dx.doi.org/10.1001/jamainternmed.2013.405 | Wrong outcomes |
| Miller TP, Brennan TA, Milstein A. How can we make more progress in measuring physicians' performance to improve the value of care? Health Aff. 2009;28(5):1429-1437. doi:10.1377/hlthaff.28.5.1429 | Wrong outcomes |
| Molloy IB, Yong TM, Keswani AH, Werth PM, Gitajn IL, Jevsevar DS. Does Productivity-Based Physician Compensation Affect Surgical Rates for Elective Arthroplasty Surgery? The Journal of arthroplasty. 2020;35(12):3445-3451.e1. doi:https://dx.doi.org/10.1016/j.arth.2020.06.066 | Wrong outcomes |
| Morton SC, Kominski GF, Kahan JP. An examination of the Resource-Based Relative Value Scale cross-specialty linkage method. Medical care. 1994;32(1):25-39. doi:https://dx.doi.org/10.1097/00005650-199401000-00003 | Wrong outcomes |

| Citation | Exclude Reason |
|---|---|
| Mrak RE, Parslow TG, Ducatman BS. Benchmarking Subspecialty Practice in Academic Anatomic Pathology: The 2017 Association of Pathology Chairs Survey. Academic pathology. 2018;5(101698648):2374289518798556. doi:https://dx.doi.org/10.1177/2374289518798556 | Wrong outcomes |
| Newhouse JP, Sinaiko AD. Estimates of physician productivity: an evaluation. Health care financing review. 2008;29(2):33-9. | Wrong publication type |
| Newhouse JP, Sinaiko AD. Productivity adjustment in the Medicare physician fee schedule update. Health care financing review. 2008;29(2):5-14. | Wrong publication type |
| Ogunfiditimi F, Takis L, Paige VJ, Wyman JF, Marlow E. Assessing the productivity of advanced practice providers using a time and motion study. Journal of healthcare management / American College of Healthcare Executives. 2013;58(3):173-6. | Wrong intervention |
| Orav EJ, Wright EA, Palmer RH, Hargraves JL. Issues of variability and bias affecting multisite measurement of quality of care. Medical care. 1996;34(9 Suppl):SS87-101. doi:https://dx.doi.org/10.1097/00005650-199609002-00009 | Wrong intervention |
| Pan D, Gu C, Cao W, et al. Development of an Incentive Model for General Practitioners in Fengxian District of Shanghai Based on Herzberg's Motivation-hygiene Theory. Chin Gen Pract. 2022;25(7):837-845. doi:10.12114/j.issn.1007-9572.2021.00.343 | Non-English |
| Pauly MV. Hospital characteristics and physician productivity and fee levels. Advances in health economics and health services research. 1982;3(8206631, 2m4):1-54. | Wrong publication type |
| Perez-Villadoniga MJ, Rodriguez-Alvarez A, Roibas D. The contribution of resident physicians to hospital productivity. The European journal of health economics : HEPAC : health economics in prevention and care. 2022;23(2):301-312. doi:https://dx.doi.org/10.1007/s10198-021-01368-z | Wrong intervention |
| Phairas D. Use objective measures to incentivize midlevel providers for increased productivity. Medical economics. 2014;91(7):31-3. | Wrong publication type |
| Rajagopalan S, Tong C. Payment Models to Coordinate Healthcare Providers with Partial Attribution of Outcome Costs. Manuf Serv Oper Manage. 2022;24(1):600-616. doi:10.1287/msom.2020.0928 | Wrong intervention |
| Rayburn B, Huxtable E. A physician productivity system that works. The Journal of medical practice management : MPM. 2005;21(1):16-20. | Wrong publication type |
| Reitblat O, Lerman TT, Dadon J, Zlatkin R, Bahar I, Sella R. Academic Productivity in Ophthalmology and Its Correlation to National Economic Indicators Among the OECD Countries: A Bibliometric Analysis. Ophthalmic epidemiology. 2024;(cg6, 9435674):1-9. doi:https://dx.doi.org/10.1080/09286586.2024.2343728 | Wrong outcomes |
| Reschovsky J, Hadley J. Physician financial incentives: use of quality incentives inches up, but productivity still dominates. Issue brief (Center for Studying Health System Change). 2007;(108):1-4. | Wrong outcomes |
| Rhein RW, Jr. Measuring physicians' productivity. Medical world news. 1979;20(8):37-4. | Wrong publication type |
| Rosati S, Valeri F, Borchiellini A, Gianfreda CM, Balestra G. Characterization of Physicians Workload in a Reference Center for the Treatment of Thrombotic and Bleeding Disorders. Institute of Electrical and Electronics Engineers Inc.; 2019:1359-1362. | Wrong outcomes |
| Sapienza AM. Measuring productivity in an ambulatory setting. Hosp Med Staff. 1980;9(4):2-9. | Wrong publication type |

| Citation | Exclude Reason |
|---|---|
| Sarangarm D, Lamb G, Weiss S, Ernst A, Hewitt L. Implementation of electronic charting is not associated with significant change in physician productivity in an academic emergency department. JAMIA open. 2018;1(2):227-232. doi:https://dx.doi.org/10.1093/jamiaopen/ooy022 | Wrong outcomes |
| Sarata AK. Health care quality: Enhancing provider accountability through payment incentives and public reporting. Nova Science Publishers, Inc.; 2013:1-23. | Wrong publication type |
| Scholle SH, Roski J, Dunn DL, et al. Availability of data for measuring physician quality performance. The American journal of managed care. 2009;15(1):67-72. | Wrong outcomes |
| Sebro R. Leveraging the electronic health record to evaluate the validity of the current RVU system for radiologists. Clinical imaging. 2021;78(cim, 8911831):286-292. doi:https://dx.doi.org/10.1016/j.clinimag.2021.02.007 | Wrong patient population |
| Shah M, De Arrigunaga S, Forman LS, West M, Rowe SG, Mishuris RG. Cumulated time to chart closure: a novel electronic health record-derived metric associated with clinician burnout. JAMIA open. 2024;7(1):ooae009. doi:https://dx.doi.org/10.1093/jamiaopen/ooae009 | Wrong outcomes |
| Shamsunder MG, Sheckter CC, Sheinin A, et al. Variation in Payment per Work Relative Value Unit for Breast Reconstruction and Nonbreast Microsurgical Reconstruction: An All-Payer Claims Database Analysis. Plastic and reconstructive surgery. 2021;147(3):505-513. doi:https://dx.doi.org/10.1097/PRS.0000000000007679 | Wrong outcomes |
| Shirom A, Nirel N, Vinokur AD. Overload, autonomy, and burnout as predictors of physicians' quality of care. J Occup Health Psychol. 2006;11(4):328-342. doi:10.1037/1076-8998.11.4.328 | Wrong outcomes |
| Shirom A, Nirel N, Vinokur AD. Work hours and caseload as predictors of physician burnout: The Mediating Effects by Perceived Workload and by Autonomy. Appl Psychol. 2010;59(4):539-565. doi:10.1111/j.1464-0597.2009.00411.x | Wrong outcomes |
| Simcox T, Becker J, Kreinces J, Islam S, Grossman M, Gould J. Are Orthopaedic Trauma Surgeons Adequately Compensated for Longer Procedures? An Analysis of Relative Value Units and Operative Times From the American College of Surgeons National Surgical Quality Improvement Program Database. Journal of orthopaedic trauma. 2021;35(12):e458-e462. doi:https://dx.doi.org/10.1097/BOT.0000000000002105 | Wrong outcomes |
| Simcox T, Kreinces J, Tarazona D, Zouzias I, Grossman M. Current Relative Value Unit Scale Does Not Appropriately Compensate for Longer Orthopedic Sports Surgeries. Arthroscopy, sports medicine, and rehabilitation. 2021;3(6):e1913-e1920. doi:https://dx.doi.org/10.1016/j.asmr.2021.09.009 | Wrong outcomes |
| Simmons NC, Kuys SS. Trial of an allied health workload allocation model. Aust Health Rev. 2011;35(2):168-175. doi:10.1071/AH09860 | Wrong patient population |
| Slater BJ, Collings AT, Corvin C, Kandel JJ. Value-based surgery physician compensation model: Review of the literature. Journal of pediatric surgery. 2022;57(9):118-123. | Wrong publication type |
| Smith DM, Martin DK, Langefeld CD, Miller ME, Freedman JA. Primary care physician productivity: the physician factor. Journal of general internal medicine. 1995;10(9):495-503. doi:https://dx.doi.org/10.1007/BF02602400 | Wrong outcomes |
| Speer AB, Schwendeman MG, Reich CC, Tenbrink AP, Siver SR. Investigating the Construct Validity of Performance Comments: Creation of the Great Eight Narrative Dictionary. J Bus Psychol. 2019;34(6):747-767. doi:10.1007/s10869-018-9599-9 | Wrong setting |

| Citation | Exclude Reason |
|---|---|
| Stefos T, Carey K, Shen M-L, Poe S, Oh DH, Moran E. The Effect of Telehealth Services on Provider Productivity. Medical care. 2021;59(5):456-460. doi:https://dx.doi.org/10.1097/MLR.0000000000001529 | Wrong outcomes |
| Stewart FM, Wasserman RL, Bloomfield CD, et al. Benchmarks in clinical productivity: A National Comprehensive Cancer Network survey. *J Oncol Pract*. 2007;3(1):2-8. doi:10.1200/JOP.0712001 | Wrong outcomes |
| Stites S, Steffen P, Turner S, Pingleton S. Aligning clinical compensation with clinical productivity: Design and implementation of the financial value unit (FVU) system in an academic department of internal medicine. Acad Med. 2013;88(7):946-951. doi:10.1097/ACM.0b013e3182959df9 | Wrong outcomes |
| Tai-Seale M, Olson CW, Li J, et al. Electronic Health Record Logs Indicate That Physicians Split Time Evenly Between Seeing Patients And Desktop Medicine. Health affairs (Project Hope). 2017;36(4):655-662. doi:https://dx.doi.org/10.1377/hlthaff.2016.0811 | Wrong outcomes |
| Tariq MB, Meier T, Suh JH, et al. Departmental Workload and Physician Errors in Radiation Oncology. Journal of patient safety. 2020;16(3):e131-e135. doi:https://dx.doi.org/10.1097/PTS.0000000000000278 | Wrong outcomes |
| Temte JL, Beasley JW, Holden RJ, et al. Relationship between number of health problems addressed during a primary care patient visit and clinician workload. Applied ergonomics. 2020;84(cyz, 0261412):103035. doi:https://dx.doi.org/10.1016/j.apergo.2019.103035 | Wrong outcomes |
| Thomas K, Birch S, Milner P, Nicholl J, Westlake L, Williams B. Estimates of general practitioner workload: a review. The Journal of the Royal College of General Practitioners. 1989;39(329):509-13. | Wrong publication type |
| Tsai MH, Huynh TT, Breidenstein MW, O'Donnell SE, Ehrenfeld JM, Urman RD. A System-Wide Approach to Physician Efficiency and Utilization Rates for Non-Operating Room Anesthesia Sites. Journal of medical systems. 2017;41(7):112. doi:https://dx.doi.org/10.1007/s10916-017-0754-z | Wrong intervention |
| Turk J, Odorizzi S, Dewhirst S, Maher J, Landreville JM. Describing resident physician productivity in a Canadian academic emergency department. CJEM. 2024;26(12):890-896. doi:https://dx.doi.org/10.1007/s43678-024-00781-6 | Wrong outcomes |
| Venta K, Baker E, Fidopiastis C, Stanney K. The value of EHR-based assessment of physician competency: An investigative effort with internal medicine physicians. Int J Med Informatics. 2017;108:169-174. doi:10.1016/j.ijmedinf.2017.08.003 | Wrong outcomes |
| Verrilli DK, Dunn DL, Sulvetta MB. The measurement of physician work and alternative uses of the resource based relative value scale. The Journal of ambulatory care management. 1996;19(4):40-8. doi:https://dx.doi.org/10.1097/00004479-199610000-00007 | Wrong publication type |
| Vilendrer SM, Asch SM, Anzai Y, Maggio P. An Incentive to Innovate: Improving Health Care Value and Restoring Physician Autonomy Through Physician-Directed Reinvestment. Academic medicine : journal of the Association of American Medical Colleges. 2020;95(11):1702-1706. doi:https://dx.doi.org/10.1097/ACM.0000000000003650 | Wrong publication type |
| Vogt WF. Physician clinical productivity--a comparison of university-based and private multispecialty medical groups. College review (Denver, Colo). 1987;4(1):63-83. | Wrong outcomes |
| Wahls TL, Futz DN. The master clinician project. The Journal of ambulatory care management. 2000;23(4):9-21. doi:https://dx.doi.org/10.1097/00004479-200010000-00003 | Wrong outcomes |

| Citation | Exclude Reason |
|---|---|
| Walker DL. Physician compensation: rewarding productivity of the knowledge worker. The Journal of ambulatory care management. 2000;23(4):48-59. doi:https://dx.doi.org/10.1097/00004479-200010000-00007 | Wrong publication type |
| Wan TH, Cooper PL. A structural equation model of physician productivity. Journal of health care marketing. 1988;8(4):37-45. | Wrong patient population |
| Wang D, Schierman BA, Cheng EM, Sanders AE, Dubinsky RM. Practical steps for implementing quality measurement in practice. Neurology Clinical practice. 2014;4(5):447-453. doi:https://dx.doi.org/10.1212/CPJ.0000000000000076 | Wrong publication type |
| Wang X, Blumenthal HJ, Hoffman D, et al. Modeling patient-related workload in the emergency department using electronic health record data. International journal of medical informatics. 2021;150(ct4, 9711057):104451. doi:https://dx.doi.org/10.1016/j.ijmedinf.2021.104451 | Wrong intervention |
| Weiss M, Marx G, Iber T. Generalizable items and modular structure for computerised physician staffing calculation on intensive care units. World journal of critical care medicine. 2017;6(3):153-163. doi:https://dx.doi.org/10.5492/wjccm.v6.i3.153 | Wrong intervention |
| Willis DR, Kelton GM, Saywell RM, Jr., Kiovsky RD. An incentive compensation system that rewards individual and corporate productivity. Family medicine. 2004;36(4):270-8. | Wrong outcomes |
| Wilson MS, Joiner KA, Inzucchi SE, et al. Improving clinical productivity in the academic setting: a novel incentive plan based on utility theory. Academic medicine : journal of the Association of American Medical Colleges. 2006;81(4):306-13. doi:https://dx.doi.org/10.1097/00001888-200604000-00003 | Wrong outcomes |
| Wood GC, Spahr R, Gerdes J, Daar ZS, Hutchison R, Stewart WF. Patient satisfaction and physician productivity: complementary or mutually exclusive? American journal of medical quality : the official journal of the American College of Medical Quality. 2009;24(6):498-504. doi:https://dx.doi.org/10.1177/1062860609338869 | Wrong outcomes |
| Woodward RS, Warren-Boulton F. Physician productivity and remuneration method. HEALTH CARE FINANC CONF PROC. 1981;Aug.:115-134. | Wrong publication type |
| Wrede J, Wrede H, Behringer W. Emergency Department Mean Physician Time per Patient and Workload Predictors ED-MPTPP. Journal of clinical medicine. 2020;9(11)doi:https://dx.doi.org/10.3390/jcm9113725 | Wrong outcomes |
| Wu SJ, Ma Q, Martin P, DeVries A. Finding the value in value-designation: Evidence and opportunity in the united states. Managed Care. 2016;2016(NOV):1-1. | Wrong intervention |
| Yeh MM, Cahill DF. Quantifying physician teaching productivity using clinical relative value units. Journal of general internal medicine. 1999;14(10):617-21. doi:https://dx.doi.org/10.1046/j.1525-1497.1999.01029.x | Wrong outcomes |

# PEER REVIEW COMMENTS AND RESPONSES

### *Are the objectives, scope, and methods for this review clearly described?*

| Comment # | Reviewer # | Comment | Author Response |
|---|---|---|---|
| 1 | 1 | Yes | *None* |
| 2 | 2 | Yes | *None* |
| 3 | 3 | Yes | *None* |
| 4 | 4 | Yes | *None* |
| 5 | 5 | Yes | *None* |

### *Is there any indication of bias in our synthesis of the evidence?*

| Comment # | Reviewer # | Comment | Author Response |
|---|---|---|---|
| 6 | 1 | No | *None* |
| 7 | 2 | No | *None* |
| 8 | 3 | No | *None* |
| 9 | 4 | No | *None* |
| 10 | 5 | No | *None* |

### *Are there any published or unpublished studies that we may have overlooked?*

| Comment # | Reviewer # | Comment | Author Response |
|---|---|---|---|
| 11 | 1 | Yes - The article below tests the Saeed productivity measure in a wider variety of VA specialties.<br><br>Yee, Christine and Palani, Sivagaminathan and Barr, Kyle and Pizer, Steven D., Provider Supply and Access to Specialty Care. Available at SSRN: https://ssrn.com/abstract=4291717 or http://dx.doi.org/10.2139/ssrn.4291717 | *Thank you for bringing this unpublished (preprint) study to our attention. We appreciate that the measure used to calculate work outputs in this study is the same as in Saeed 2024 (included in this review). We identified a related published study by the same authors (https://doi.org/10.1002/hec.4482) in our literature search. However, the aim of these studies (to estimate the effect of clinician supply on new patient wait times) is outside of the scope of this review and therefore neither study is included.* |
| 12 | 2 | No | *None* |

| Comment # | Reviewer # | Comment | Author Response |
|---|---|---|---|
| 13 | 3 | No | *None* |
| 14 | 4 | No | *None* |
| 15 | 5 | No | *None* |

***Additional suggestions or comments can be provided below.***

| Comment # | Reviewer # | Comment | Author Response |
|---|---|---|---|
| 16 | 1 | This is an excellent summary of the current literature and thinking on productivity measures for potential use in public delivery systems like the VA.<br><br>One issue that the authors should consider is the practicality of measurements for management purposes. Some of the measures reviewed can be constructed entirely from administrative data, which implies that they can be calculated at a high frequency and granularity, allowing specific clinics to be tracked at high frequency (like by pay period). Other measures rely on survey data, which is collected much less frequently (like annually) and with much smaller samples. These data limitations make them difficult or impossible to operationalize for management purposes. | *Thank you. We added text to the Future Research section to highlight the importance of ensuring that measures used to develop productivity calculations are available, accessible, and timely so that they are feasible to adopt in practice.* |
| 17 | 1 | Page vi, line 8: "priorities" should be "prioritizes" | *Revised* |
| 18 | 1 | Page 4, lines 53-55: This sentence should be rephrased. As is, it suggests that procedural services are historically undervalued compared to cognitive services, which is backwards. | *Thank you for identifying this error. We revised the text for clarity.* |
| 19 | 1 | Page 5, line 20: "although does" should be "although it does" | *Revised* |
| 20 | 1 | Page 12, line 28: "priorities" again | *Revised* |
| 21 | 1 | Page 12, line 38: "that" should be "than" | *Revised* |
| 22 | 2 | I would recommend expansion of your definition of productivity. Figure 1 could be updated to show the flow of inputs to the outputs. I find the "output/input" concept to be too reductive. The idea of productivity is how organizations use inputs to make outputs. An organization is producing efficiently when it maximizes its production of outputs with its currently available inputs and knowledge. | *Thank you for this comment. We aligned our approach to this review with the VHA's current definition of productivity, which is based on an output/input equation. We agree that a productivity model that incorporates measures of efficiency would be more holistic, and arguably more appropriate. We added text to highlight this point in the Future Research section.* |

| Comment # | Reviewer # | Comment | Author Response |
|---|---|---|---|
| 23 | 4 | Looks like we are limited in recommendations. We could suggest alternatives that don't exist yet. For example While the use of clinic time offers improvements over traditional FTE measures by providing a more standardized view of labor input, it still may not fully capture the broad range of clinical activities performed by modern physicians. An alternative approach could be to adopt a Weighted Clinical Engagement Unit (WCEU) system, where a variety of physician tasks—such as in-person visits, telehealth encounters, e-consultations, care coordination activities, and teaching responsibilities—are assigned standardized unit values based on cognitive effort, patient impact, and time requirements. This method would allow healthcare systems to measure physician productivity more holistically, fairly recognizing contributions beyond face-to-face clinic encounters. Implementing WCEUs would require careful calibration and reliable activity tracking but could better align productivity assessments with the evolving nature of clinical practice, interdisciplinary care, and patient-centered outcomes. | *Thank you for this comment. We added to the Future Research section by suggesting a role for new measure development, including measures aligned with specific physician tasks as you suggest.* |
| 24 | 5 | Page i: Abbreviations list incomplete: AMA, MGMA, RBRVU, RUC, OPES, GEE, DEA, OLS, SHEP, VA are missing. | *Revised* |
| 25 | 5 | Page 5, Line 9 and page 13 Line 47: You cannot conclude organizational "interest" BUT could say "data and expertise". | *Revised* |
| 26 | 5 | Page v Line 48 and page 6 Line 52: suggest you add start date not just end date (Dec 2024). | *We have added “from inception” to clarify the search start dates.* |
| 27 | 5 | Page. vi, Line 8 "Priorities" should be "prioritizes" | *Revised* |