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Health Services Research in Rehabilitation and Disability – The Time is Now

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Abstract

Policy drives practice, and health services research (HSR) is at the intersection of policy, practice and patient outcomes. HSR specific to rehabilitation and disability is particularly needed. As rehabilitation researchers and providers, we are uniquely positioned to provide the evidence that guides reforms targeting rehabilitative care. We have the expertise to define the value of rehabilitation in a policy-relevant context. HSR is a powerful tool for providing this evidence. We need to continue building capacity for conducting rigorous, timely rehabilitation-related HSR. Fostering stakeholder engagement in these research efforts will ensure we maintain a patient-centered focus as we address the “Triple Aim” of better care, better health, and better value. In this Special Communication we discuss the role of rehabilitation researchers in HSR. We also provide information on current resources available in our field for conducting HSR and identify gaps for capacity-building and future research. Healthcare reforms are a reality, and through HSR we can give rehabilitation a strong voice during these transformative times.

We established the rehabilitation-related health services taskforce within the Measurement Networking Group of the American Congress of Rehabilitation Medicine (ACRM) in 2016. The explicit mission of the Taskforce is *to facilitate collaboration and increase the scope and effectiveness of rehabilitation-relevant health services research*. The intent of this article is to

provide a brief overview of health services research (HSR) and to emphasize the importance of disability and rehabilitation investigators participating in this dynamic field. Our message should not be viewed as an official position stand, but rather as a collective commentary based on recent observations and discussions among Taskforce members.

As members of the largest rehabilitation research organization, ACRM investigators and readers of *Archives* have the opportunity to actively participate in research that directly informs how rehabilitation services are organized, delivered, evaluated, and reimbursed. By conducting timely, rigorous HSR projects, we can guide decision-making by policymakers and health system administrators. Findings can also be used to support patients, caregivers and healthcare professionals with the decisions made during the course of care. The Taskforce aims to support those efforts by identifying existing strengths and common interests among current ACRM researchers. Our goal is to foster collaborations that allow us as a field to make meaningful contributions to the evidence.

This is not the first call for the disability and rehabilitation research community to take a leadership role in strengthening HSR within the field. Batavia and DeJong¹ wrote on the importance of increasing capacity for HSR in disability and rehabilitation more than 25 years ago, and much of the rationale they provided could simply be reiterated today. While progress has been made since 1990, many of the barriers they described remain. Fortunately, the timing and opportunities for affecting substantial change have never been better. As we describe below, healthcare reform is shining a spotlight on post-acute rehabilitation, which is 1) effectively elevating the relevance of research from the field, 2) promoting collaborative opportunities with investigators from other disciplines (e.g., biostatistics, economics, informatics, policy, etc.), and 3) inspiring education and training program redesigns for growth within the field.

Overview of HSR

While informing and delivering evidence-based practice is the articulated goal for clinical researchers and providers, respectively, policy clearly drives practice. The role of scientific evidence in shaping and/or implementing specific policies is less clear. Studying the effects of policy reform on healthcare delivery and patient outcomes is a necessity in today's environment of perpetual change. HSR is at this intersection of policy, practice and patient outcomes. The focus is on establishing real world evidence on the access, provision, costs and outcomes of health care.² Lohr and Steinwachs³ are credited with the prevailing definition of HSR as a “*multidisciplinary field of scientific investigation that studies how social factors, financing systems, organizational structures and processes, health technologies, and personal behaviours affect access to health care, the quality and cost of health care, and ultimately our health and well-being.*” HSR can provide important insight into opportunities for achieving better care, lower costs and improved health outcomes.

Many recent healthcare delivery and payment reforms explicitly target post-acute rehabilitative care. Examples include the Improving Medicare Post-Acute Care Transformation (IMPACT) Act⁴ and the Comprehensive Care for Joint Replacement Model.⁵ Pending reforms, such as the Unified Payment Model for Post-Acute Care,⁶ also

focus exclusively on the costs and/or quality of rehabilitation services. These initiatives will directly influence the way care is delivered by providers, evaluated by payers and policymakers, and experienced by patients and their families. The National Quality Forum includes more than one hundred rehabilitation-related quality measures targeting different aspects of care or patient populations. Some of these measures are related to specific reform initiatives, while others align with a component of care delivery (e.g. process measures).⁷

HSR can provide data and evidence to make care effective, accessible, affordable, safe, equitable, and patient-centered. Findings from HSR can provide tools to guide healthcare decision-making and to inform policy. This type of research is appreciably broad, extending from research on quality measures to discharge planning and from comparative clinical and cost effectiveness to workforce availability. In Table 1, we identify five familiar research terms that fall under the HSR umbrella and list recently published examples in each category to illustrate the diversity of topics and research designs contributing to disability- and rehabilitation-related HSR. These “applied” types of research, which emphasize the non-biological aspects of health and medical care, can address several distinct levels of our healthcare ecosystem—rehabilitation providers and teams, clinical settings, institutions, society—and can be focused on the health status of individuals and/or populations.⁸ Accordingly, the value of HSR for rehabilitation providers and the patients served is extraordinary.

Rehabilitative care is goal-oriented and driven by patients’ personal preferences and characteristics. In this regard, rehabilitation has always been patient-centered, and HSR can help identify the factors facilitating or challenging the delivery of patient-centered care, including the necessary resources underlying appropriate care.⁹ Particularly for post-acute healthcare providers, HSR insights into inefficiencies and care deficiencies can begin to explain patients’ outcomes and establish an agenda for improving care. HSR on social factors, family/caregiver needs, and the structure and financing of rehabilitation care can be aimed at restoring and maintaining patients’ functional independence and promoting optimal health.

Inexplicably, health outcome metrics for the U.S. are average at best, despite being the world leader in health research and healthcare costs. Cook-Deegan¹⁰ explains, “it is notoriously difficult to link improvements in health outputs to research inputs.” Others contend this link is broken by the slow, inconsistent and ineffective translation of medical evidence into practice.¹¹ Different types of HSR are being used to identify the obstacles to translation, narrow the time gap from established efficacy to policy and practice change, and document real world evidence to improve the current standard of care. HSR approaches are critical for helping rehabilitation professionals recognize, deliver, and promote high-value care.¹² We need to build capacity within the field for research that more directly informs both clinical and health policy decision making.

Building Capacity for Rehabilitation-relevant HSR

As rehabilitation researchers and providers, we are uniquely positioned to provide the evidence that guides reforms targeting rehabilitative care. We have the expertise to define the

value of rehabilitation in a policy-relevant context. We need more people engaged in HSR to produce high quality evidence for the value of rehabilitative care. Examples of needed rehabilitation-relevant HSR include: determining the workforce required to meet demand; examining whether the structure of rehabilitative care is efficient, timely and patient-centered; identifying interventions to promote increased access; examining variation in care delivery; understanding how variation affects outcomes; identifying guideline deviations and opportunities to improve care; comparing clinical effectiveness to identify strategies, interventions or care models that produce superior outcomes; conducting implementation research of evidence-based interventions; and reviewing and/or analyzing health policies, programs, practices, interventions, or techniques for their effect on changes in health, functional status, symptomatology, severity, care experience and satisfaction, costs, and quality of life. These examples of HSR are inherently multi-disciplinary and it is important for rehabilitation providers, researchers and consumers to be active stakeholders with a voice in the study design and interpretation of findings. This will ensure the research addresses clinically and policy relevant questions and that the outcomes are meaningful to patients.¹³

Academic programs for rehabilitation professions and research have defined curricula to ensure students establish competencies in understanding the principles of epidemiological studies that establish base rates of a condition or disease; translational studies that establish first use of a device, procedure, medication, or technique with patients; and experimental studies that examine efficacy. Many programs are expanding and including HSR principles. However, our capacity for rigorous rehabilitation-relevant HSR currently lags behind our capacity for other types of research, particularly traditional, efficacy-based clinical research. HSR is an important component in the continuum of research as it improves evidence-based practice. Government agencies recognized this gap decades ago and continue to evolve in their infrastructure to support training and funding. The Agency for Healthcare Research and Quality (AHRQ) is the leading federal agency charged to support HSR. AHRQ's mission is "to produce evidence to make health care safer, higher quality, more accessible, equitable, and affordable, and to work within the U.S. Department of Health and Human Services and with other partners to make sure the evidence is understood and used."¹⁴ The agency's areas of focus align well with rehabilitation-related HSR, and greater engagement across our two communities would increase attention to the need for rehabilitation-related HSR and support our interest in building teams to address these needs. More recently, the Center for Medicare and Medicaid Innovation within the Centers for Medicare and Medicaid Services (CMS) was established to support development and testing of care models and novel approaches to health care payment. Many of these demonstration projects directly or indirectly target rehabilitation services.

Nationally, the Veterans Administration established an office for Health Services Research and Development (HSR&D) to promote and support HSR that "examines the organization, delivery, and financing of health care, from the perspectives of patients, caregivers, providers, and managers to improve the quality and economy of care."¹⁵ In addition to a vast network of training opportunities, HSR&D also supports 19 Centers of Innovation (COINs) including a Center of Innovation on Disability and Rehabilitation Research. Beyond this Florida-based center, not all COINs explicitly include rehabilitation providers or researchers but all address rehabilitation-related areas of research.

The National Institutes of Health (NIH) funds the Center for Large Data Research and Data Sharing in Rehabilitation (CLDR) to provide resources and educational opportunities promoting collaborative rehabilitation and disability outcomes research using large administrative and research datasets.¹⁶ The CLDR is part of the NIH Medical Rehabilitation Research Resource Network of infrastructure grants supported primarily through the National Center for Medical Rehabilitation Research. The CLDR's mission is to build rehabilitation research capacity in large data research and to fund pilot research and visiting scholar programs. The Center offers workshops, training and research mentorship. Secondary data analysis using large datasets is a core area of HSR. Because changes in healthcare policy and practice are currently being driven through the use of large data, more rehabilitation investigators with large data skills are needed.

As a discipline, physical therapy has been proactive in informing and motivating its membership to become actively involved in HSR.¹⁷ The Foundation for Physical Therapy, with major financial support from the American Physical Therapy Association, provided \$2.5 million to establish the Center on Health Services Training and Research (CoHSTAR) in 2015. CoHSTAR is a multi-institutional collaboration that supports and promotes physical therapy HSR. Further, the discipline's flagship journal (PTJ) recently published a series of HSR special issues.¹⁸ The emphasis on HSR is beginning to emerge across other rehabilitation disciplines, as well. Recent publications demonstrate the efforts to highlight the value of occupational therapy in the context of current healthcare reform initiatives; however, the efforts to increase capacity for HSR in occupational therapy and other rehabilitation disciplines are currently not as established as physical therapy.^{19, 20}

Moving Forward

Donald Berwick, former Director of CMS and President and Chief Executive Officer of the Institute of Healthcare Improvement, recently identified ten HSR topics where he felt findings over the next decade would enable policymakers, health systems, and providers to make real progress towards the "Triple Aim" of better care, better health, and better value.^{21, 22} We have proposed an adaption of his list specific to rehabilitation (Table 2) and contend that these focus areas have broad implications. Findings from research in these areas will identify aspects of rehabilitative care delivery (e.g. patterns and processes) associated with better outcomes, inform efficient use of resources during rehabilitative care, and improve assessments of rehabilitative care quality. Although rehabilitation-specific, HSR in the listed focus areas has the potential to improve health and healthcare over the next decade. We hope that this list can serve as a logical guide for rehabilitation HSR investigators and stakeholders to begin answering critical questions and contributing relevant information to the healthcare redesign and policy discussions. It is critical that we demonstrate the value of rehabilitative care and continue to further improve its value. HSR is a powerful tool for achieving these objectives, and as rehabilitation researchers, we are the most qualified individuals to conduct this research. Healthcare reforms are a reality, and together we can give rehabilitation a strong voice during these transformative times.

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References

1. Batavia AI, DeJong G. Developing a comprehensive health services research capacity in physical disability and rehabilitation. *Journal of Disability Policy Studies*. 1990; 1(1):37–61.
2. Horner RD, Russ-Sellers R, Youkey JR. Rethinking health services research. *Medical Care*. 2013; 51(12):1031–3. [PubMed: 24220683]
3. Lohr KN, Steinwachs DM. Health services research: an evolving definition of the field. *Health Services Research*. 2002; 37(1):7–9. [PubMed: 11949927]
4. Centers for Medicare & Medicaid Services. IMPACT Act of 2014 data standardization & cross setting measures 2016. Updated: 09/14/2016. Available from: <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/Post-Acute-Care-Quality-Initiatives/IMPACT-Act-of-2014/IMPACT-Act-of-2014-Data-Standardization-and-Cross-Setting-MeasuresMeasures.html>. Accessed on 03/30/2017
5. Centers for Medicare & Medicaid Services. Comprehensive care for joint replacement model. 2017. Updated: 03/30/2017. Available from: <https://innovation.cms.gov/initiatives/cjr>. Accessed on 03/30/2017
6. Medicare Payment Advisory Commission. Report to the Congress: Medicare and the Health Care Delivery System. Washington, DC: 2016. 06/2016
7. National Quality Forum. All-cause admissions and readmissions project 2015–2017. 2017. Updated: 2017. Available from: <http://www.qualityforum.org/ProjectMeasures.aspx?projectId=80625>. Accessed on 03/30/2017
8. National Library of Medicine. National information center on health services research information central. 2017. Updated: 03/28/2017. Available from: <https://www.nlm.nih.gov/hsrinfo/>. Accessed on 03/30/2017
9. Institute of Medicine. Health Services Research: Report of a Study. Washington, DC: The National Academies Press; 1979.
10. Cook-Deegan R, Public health. Boosting health services research. *Science*. 2011; 333(6048):1384–5. [PubMed: 21903796]
11. Lenfant C. Shattuck lecture—clinical research to clinical practice—lost in translation? *New England Journal of Medicine*. 2003; 349(9):868–74. [PubMed: 12944573]
12. Rundell SD, Goode AP, Friedly JL, Jarvik JG, Sullivan SD, Bresnahan BW. Role of Health Services Research in Producing High-Value Rehabilitation Care. *Physical Therapy*. 2015; 95(12):1703–11. [PubMed: 26316531]
13. Sinopoli A, Russ-Sellers R, Horner RD. Clinically driven health services research. *Medical Care*. 2014; 52(3):183–4. [PubMed: 24374427]
14. Agency for Healthcare Research and Quality. Agency for Healthcare Research and Quality: A Profile. 2017. Updated: 02/2017. Available from: <https://www.ahrq.gov/cpi/about/profile/index.html>. Accessed on 03/30/2017
15. U.S. Department of Veterans Affairs. Health Services Research & Development. 2014. Updated: 03/28/2014. Available from: <https://www.hsrdr.research.va.gov/funding/what-is-hsr.cfm>. Accessed on 03/30/2017
16. Center for Large Data Research and Data Sharing in Rehabilitation (CLDR). About the Center. 2015. Updated: 11/2015. Available from: <https://rehabsciences.utmb.edu/cldr/about.asp>. Accessed on 03/30/2017

17. Landry MD, Goldstein M, Stokes E. Physiotherapy health services research (PHSR): the road 'that must now be taken'. *Physiotherapy Research International*. 2012; 17(2):63–5. [PubMed: 22674860]
18. Resnik L, Freburger JK. Health Services Research: Physical Therapy Has Arrived! *Physical Therapy*. 2015; 95(12):1605–7. [PubMed: 26628532]
19. Rogers AT, Bai G, Lavin RA, Anderson GF. Higher Hospital Spending on Occupational Therapy Is Associated With Lower Readmission Rates. *Medical Care Research & Review*. 2016; 02:02.
20. Leland NE, Fogelberg DJ, Halle AD, Mroz TM. Occupational Therapy and Management of Multiple Chronic Conditions in the Context of Health Care Reform. *American Journal of Occupational Therapy*. 2017; 71(1):7101090010p1–p6.
21. Berwick DM, Nolan TW, Whittington J. The triple aim: care, health, and cost. *Health Affairs*. 2008; 27(3):759–69. [PubMed: 18474969]
22. Berwick DM. Health Services Research, Medicare, and Medicaid: A Deep Bow and a Rechartered Agenda. *Milbank Quarterly*. 2015; 93(4):659–62. [PubMed: 26626975]
23. Stineman MG, Kwong PL, Bates BE, Kurichi JE, Ripley DC, Xie D. Development and validation of a discharge planning index for achieving home discharge after hospitalization for acute stroke among those who received rehabilitation services. *Am J Phys Med Rehabil*. 2014; 93(3):217–30. [PubMed: 24088779]
24. Fonarow GC, Liang L, Thomas L, Xian Y, Saver JL, Smith EE, et al. Assessment of Home-Time After Acute Ischemic Stroke in Medicare Beneficiaries. *Stroke*. 2016; 47(3):836–42. [PubMed: 26892279]
25. Mallinson T, Pape TL, Guernon A. Responsiveness, Minimal Detectable Change, and Minimally Clinically Important Differences for the Disorders of Consciousness Scale. *J Head Trauma Rehabil*. 2016; 31(4):E43–51.
26. Jette DU, Stilphen M, Ranganathan VK, Passek SD, Frost FS, Jette AM. Validity of the AM-PAC “6-Clicks” inpatient daily activity and basic mobility short forms. *Phys Ther*. 2014; 94(3):379–91. [PubMed: 24231229]
27. Bettger JP, Thomas L, Liang L, Xian Y, Bushnell CD, Saver JL, et al. Hospital Variation in Functional Recovery After Stroke. *Circ Cardiovasc Qual Outcomes*. 2017; 10(1)
28. Leland NE, Gozalo P, Christian TJ, Bynum J, Mor V, Wetle TF, et al. An Examination of the First 30 Days After Patients are Discharged to the Community From Hip Fracture Postacute Care. *Med Care*. 2015; 53(10):879–87. [PubMed: 26340664]
29. Bates BE, Hallenbeck R, Ferrario T, Kwong PL, Kurichi JE, Stineman MG, et al. Patient-, treatment-, and facility-level structural characteristics associated with the receipt of preoperative lower extremity amputation rehabilitation. *PM R*. 2013; 5(1):16–23. [PubMed: 22939239]
30. Jia H, Pei Q, Sullivan CT, Cowper Ripley DC, Wu SS, Bates BE, et al. Poststroke Rehabilitation and Restorative Care Utilization: A Comparison Between VA Community Living Centers and VA-contracted Community Nursing Homes. *Med Care*. 2016; 54(3):235–42. [PubMed: 26807537]
31. Seel RT, Barrett RS, Beaulieu CL, Ryser DK, Hammond FM, Cullen N, et al. Institutional Variation in Traumatic Brain Injury Acute Rehabilitation Practice. *Arch Phys Med Rehabil*. 2015; 96(8 Suppl):S197–208. [PubMed: 26212397]
32. Pitzul KB, Wodchis WP, Carter MW, Kreder HJ, Voth J, Jaglal SB. Post-acute pathways among hip fracture patients: a system-level analysis. *BMC Health Serv Res*. 2016; 16(1):275. [PubMed: 27430219]
33. Rundell SD, Gellhorn AC, Comstock BA, Heagerty PJ, Friedly JL, Jarvik JG. Clinical outcomes of early and later physical therapist services for older adults with back pain. *Spine J*. 2015; 15(8): 1744–55. [PubMed: 25849809]
34. Mallinson T, Deutsch A, Bateman J, Tseng HY, Manheim L, Almagor O, et al. Comparison of discharge functional status after rehabilitation in skilled nursing, home health, and medical rehabilitation settings for patients after hip fracture repair. *Arch Phys Med Rehabil*. 2014; 95(2): 209–17. [PubMed: 23850612]
35. Fritz JM, Brennan GP, Hunter SJ. Physical Therapy or Advanced Imaging as First Management Strategy Following a New Consultation for Low Back Pain in Primary Care: Associations with

- Future Health Care Utilization and Charges. *Health Serv Res.* 2015; 50(6):1927–40. [PubMed: 25772625]
36. Brusco NK, Watts JJ, Shields N, Taylor NF. Is cost effectiveness sustained after weekend inpatient rehabilitation? 12 month follow up from a randomized controlled trial. *BMC Health Serv Res.* 2015; 15:165. [PubMed: 25927870]
37. Dicianno BE, Lovelace J, Peele P, Fassinger C, Houck P, Bursic A, et al. Effectiveness of a Wellness Program for Individuals With Spina Bifida and Spinal Cord Injury Within an Integrated Delivery System. *Arch Phys Med Rehabil.* 2016; 97(11):1969–78. [PubMed: 27311718]
38. Holstege MS, Caljouw MA, Zekveld IG, van Balen R, de Groot AJ, van Haastregt JC, et al. Successful Geriatric Rehabilitation: Effects on Patients' Outcome of a National Program to Improve Quality of Care, the SINGER Study. *J Am Med Dir Assoc.* 2016
39. Ottenbacher KJ, Karmarkar A, Graham JE, Kuo YF, Deutsch A, Reistetter TA, et al. Thirty-day hospital readmission following discharge from postacute rehabilitation in fee-for-service Medicare patients. *JAMA.* 2014; 311(6):604–14. [PubMed: 24519300]
40. Middleton A, Graham JE, Lin YL, Goodwin JS, Bettger JP, Deutsch A, et al. Motor and Cognitive Functional Status Are Associated with 30-day Unplanned Rehospitalization Following Post-Acute Care in Medicare Fee-for-Service Beneficiaries. *Journal of General Internal Medicine.* 2016; 31(12):1427–34. [PubMed: 27439979]
41. Jung HY, Trivedi AN, Grabowski DC, Mor V. Does More Therapy in Skilled Nursing Facilities Lead to Better Outcomes in Patients With Hip Fracture? *Phys Ther.* 2016; 96(1):81–9. [PubMed: 26586858]
42. Andrews AW, Li D, Freburger JK. Association of Rehabilitation Intensity for Stroke and Risk of Hospital Readmission. *Phys Ther.* 2015; 95(12):1660–7. [PubMed: 26089042]
43. Graham JE, Prvu Bettger J, Fisher SR, Karmarkar AM, Kumar A, Ottenbacher KJ. Duration to Admission and Hospital Transfers Affect Facility Rankings from the Postacute 30-Day Rehospitalization Quality Measure. *Health Services Research.* 2017; 52(3):1024–39. [PubMed: 27349684]
44. Gozalo PL, Resnik LJ, Silver B. Benchmarking Outpatient Rehabilitation Clinics Using Functional Status Outcomes. *Health Serv Res.* 2016; 51(2):768–89. [PubMed: 26251040]

Provider's Perspective

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Health system administrators, clinical managers, and frontline clinicians are ultimately tasked with the design and delivery of patient care. Relevant HSR can and should directly influence those complex decisions and processes. That said, HSR investigators can play an important role in promoting and facilitating research-to-practice translation. Below, I list three ways we can strengthen the relationship between research and practice, each followed by brief suggestions for HSR investigators to consider.

First, we can help providers value the research questions and recognize the benefits of implementing the evidence from a given study. Investigators can enhance understanding by framing the study objectives in relatable terms and clearly articulating potential clinical implications. This extends beyond the language used in the Introduction and Discussion to describe the study's rationale and conclusions, respectively. The presentation of results can also be improved by emphasizing clinical meaningfulness over statistical significance.

Second, we can help guide practice by addressing the components of care of interest to providers. Providers are concerned with the effectiveness, efficiency, and costs of treatment, and are simultaneously responsible for maintaining the structures, processes, and outcomes of care. However, traditional research studies are purposely singularly focused. It would be naïve and impractical to suggest that individual studies include variables from all possible aspects of clinical care. However, it is reasonable to suggest that investigators interpret their specific findings in the context of everyday clinical practice; i.e., connect the dots for providers by addressing the current standard(s) of care, relative resource requirements, implementation strategies, and projected impacts on a specified volume of patients.

Third, we can foster inclusion of non-researcher stakeholders. Clinical practice is inherently multidisciplinary. While translational research and HSR have inspired the 'team science' movement, these teams are still predominantly researchers, simply from different disciplines. Including stakeholders (providers, consumers, etc.) in the research process essentially guarantees more relevant research questions and greater likelihood of implementation. These contributions can be described in the Methods and/or recognized in the Acknowledgements of resultant manuscripts.

Strengthening the relationship between HSR and practice will help providers integrate the evidence and ultimately improve the cost and quality of care for individuals and populations. Moving forward, the connection between research and practice will be largely influenced by the imagination and determination of HSR investigators.

Table 1

Examples of recent rehabilitation-related HSR publications grouped by familiar research subtypes

Measurement	Measure Development
	Stineman MG, Kwong PL, Bates BE, Kurichi JE, Ripley DC, Xie D. Development and validation of a discharge planning index for achieving home discharge after hospitalization for acute stroke among those who received rehabilitation services. <i>Am J Phys Med Rehabil.</i> 2014;93(3):217–230. ²³
	Fonarow GC, Liang L, Thomas L, et al. Assessment of Home-Time After Acute Ischemic Stroke in Medicare Beneficiaries. <i>Stroke.</i> 2016;47(3):836–842. ²⁴
	Psychometrics
	Mallinson T, Pape TL, Guernon A. Responsiveness, Minimal Detectable Change, and Minimally Clinically Important Differences for the Disorders of Consciousness Scale. <i>J Head Trauma Rehabil.</i> 2016;31(4):E43–51. ²⁵
	Jette DU, Stilphen M, Ranganathan VK, Passek SD, Frost FS, Jette AM. Validity of the AM-PAC “6-Clicks” inpatient daily activity and basic mobility short forms. <i>Phys Ther.</i> 2014;94(3):379–391. ²⁶
Variation	Clinical Outcomes
	Bettger JP, Thomas L, Liang L, et al. Hospital Variation in Functional Recovery After Stroke. <i>Circ Cardiovasc Qual Outcomes.</i> 2017;10(1). ²⁷
	Leland NE, Gozalo P, Christian TJ, et al. An Examination of the First 30 Days After Patients are Discharged to the Community From Hip Fracture Postacute Care. <i>Med Care.</i> 2015;53(10):879–887. ²⁸
	Access
	Bates BE, Hallenbeck R, Ferrario T, et al. Patient-, treatment-, and facility-level structural characteristics associated with the receipt of preoperative lower extremity amputation rehabilitation. <i>PM R.</i> 2013;5(1):16–23. ²⁹
	Jia H, Pei Q, Sullivan CT, et al. Poststroke Rehabilitation and Restorative Care Utilization: A Comparison Between VA Community Living Centers and VA-contracted Community Nursing Homes. <i>Med Care.</i> 2016;54(3):235–242. ³⁰
	Care-delivery
	Seel RT, Barrett RS, Beaulieu CL, et al. Institutional Variation in Traumatic Brain Injury Acute Rehabilitation Practice. <i>Arch Phys Med Rehabil.</i> 2015;96(8 Suppl):S197–208. ³¹
Comparative Effectiveness	Clinical Outcomes
	Rundell SD, Gellhorn AC, Comstock BA, Heagerty PJ, Friedly JL, Jarvik JG. Clinical outcomes of early and later physical therapist services for older adults with back pain. <i>Spine J.</i> 2015;15(8):1744–1755. ³³
	Mallinson T, Deutsch A, Bateman J, et al. Comparison of discharge functional status after rehabilitation in skilled nursing, home health, and medical rehabilitation settings for patients after hip fracture repair. <i>Arch Phys Med Rehabil.</i> 2014;95(2):209–217. ³⁴
	Cost and/or Utilization
	Fritz JM, Brennan GP, Hunter SJ. Physical Therapy or Advanced Imaging as First Management Strategy Following a New Consultation for Low Back Pain in Primary Care: Associations with Future Health Care Utilization and Charges. <i>Health Serv Res.</i> 2015;50(6):1927–1940. ³⁵
	Brusco NK, Watts JJ, Shields N, Taylor NF. Is cost effectiveness sustained after weekend inpatient rehabilitation? 12 month follow up from a randomized controlled trial. <i>BMC Health Serv Res.</i> 2015;15:165. ³⁶
Implementation Research	Implementation Studies
	Dicianno BE, Lovelace J, Peele P, et al. Effectiveness of a Wellness Program for Individuals With Spina Bifida and Spinal Cord Injury Within an Integrated Delivery System. <i>Arch Phys Med Rehabil.</i> 2016;97(11):1969–1978. ³⁷
	Holstege MS, Caljouw MA, Zekveld IG, et al. Successful Geriatric Rehabilitation: Effects on Patients’ Outcome of a National Program to Improve Quality of Care, the SINGER Study. <i>J Am Med Dir Assoc.</i> 2016. ³⁸
Quality Assessment	Identification of Predictors and/or Risk factors

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Ottenbacher KJ, Karmarkar A, Graham JE, et al. Thirty-day hospital readmission following discharge from postacute rehabilitation in fee-for-service Medicare patients. <i>JAMA</i> . 2014;311(6):604–614. ³⁹
Middleton A, Graham JE, Lin YL, et al. Motor and Cognitive Functional Status Are Associated with 30-day Unplanned Rehospitalization Following Post-Acute Care in Medicare Fee-for-Service Beneficiaries. <i>J Gen Intern Med</i> . 2016;31(12):1427–34. ⁴⁰
Processes of Care
Jung HY, Trivedi AN, Grabowski DC, Mor V. Does More Therapy in Skilled Nursing Facilities Lead to Better Outcomes in Patients With Hip Fracture? <i>Phys Ther</i> . 2016;96(1):81–89. ⁴¹
Andrews AW, Li D, Freburger JK. Association of Rehabilitation Intensity for Stroke and Risk of Hospital Readmission. <i>Phys Ther</i> . 2015;95(12):1660–1667. ⁴²
Provider performance
Graham JE, Prvu Bettger J, Fisher SR, Karmarkar AM, Kumar A, Ottenbacher KJ. Duration to Admission and Hospital Transfers Affect Facility Rankings from the Postacute 30-Day Rehospitalization Quality Measure. <i>Health Serv Res</i> . 2017;52(3):1024–39. ⁴³
Gozalo PL, Resnik LJ, Silver B. Benchmarking Outpatient Rehabilitation Clinics Using Functional Status Outcomes. <i>Health Serv Res</i> . 2016;51(2):768–789 ⁴⁴

Table 2

Ten focus areas for Rehabilitation-related HSR to improve health and healthcare over the next decade.

Adapted from Berwick 2015.²²

<i>Better ways to involve rehabilitation professionals in change.</i>
Clinician engagement is key to affecting change. Efforts to date have been ineffective. We need new strategies to facilitate clinician participation in the process.
<i>Transitional business models for rehabilitation services in all parts of the care continuum.</i>
With the clear shift from volume- to value-based payment systems, providers need practical information on transitioning from fee-for-service to quality and/or shared accountability (episodic) reimbursement models.
<i>Scaling changes.</i>
Implementation projects demonstrating how to scale up new care models for widespread (universal) use are needed.
<i>Embracing the beliefs and expectations of patients, families, and communities.</i>
We need to identify relevant stakeholders, engage them, and rethink the way we view stakeholder preferences, expectations, and accountability.
<i>Understanding the nature and magnitude of waste in rehabilitation services.</i>
Documenting variations in resource utilization is not sufficient. Variations in cost are often not associated with quality or outcomes. We need to be probing where and why there is overuse of ineffective therapies and underuse of effective therapies.
<i>Creating the new workforce.</i>
New care and payment models may require new clinical roles or even disciplines, which may span established, discipline-specific scopes-of-practice.
<i>Exploiting and developing digital health technology.</i>
Technology is advancing rapidly, but it will take sound, multidisciplinary research to select utility over trendy, and to evaluate the trade-offs of virtual and remote clinical encounters.
<i>Rationalizing measurement.</i>
Quality and performance measurement in healthcare are spiraling out of control. New measurement programs need to balance informative assessment with clinical efficiency.
<i>Redesigning the “scoring rules” used by key federal actors.</i>
Need to educate federal agencies about the type and value of information available from modern research designs and methodologies.
<i>Developing more dynamic evaluation methods.</i>
Healthcare reform evolves more rapidly than health research methodologies. Program evaluation procedures need to employ more efficient and pragmatic approaches.