Published in final edited form as:
Arch Phys Med Rehabil. 2007 November ; 88(11): 1526–1534. doi:10.1016/j.apmr.2007.06.768.

Effectiveness of Multidisciplinary Rehabilitation Services in Postacute Care: State-of-the-Science. A Review

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Abstract

Objectives—To summarize the efficacy of postacute rehabilitation and to outline future research strategies for increasing knowledge of its effectiveness.

Data Sources—English-language systematic reviews that examined multidisciplinary therapy-based rehabilitation services for adults, published in the last 25 years and available through Cochrane, Medline, or CINAHL databases. We excluded multidisciplinary biopsychosocial rehabilitation programs and mental health services.

Study Selection—Using the search term *rehabilitation*, 167 records were identified in the Cochrane database, 1163 meta-analyses and reviews were identified in Medline, and 226 in CINAHL. The Medline and CINAHL search was further refined with 3 additional search terms: *therapy*, *multidisciplinary*, and *interdisciplinary*. In summary, we used 12 reviews to summarize the efficacy of multidisciplinary, therapy-based postacute rehabilitation; the 12 covered only 5 populations.

Data Extraction—Two reviewers extracted information about study populations, sample sizes, study designs, the settings and timing of rehabilitation, interventions, and findings.

Data Synthesis—Based on systematic reviews, the evidence for efficacy of postacute rehabilitation services across the continuum was strongest for stroke. There was also strong evidence supporting multidisciplinary inpatient rehabilitation for patients with rheumatoid arthritis, moderate to severe acquired brain injury, including traumatic etiologies, and for older adults. Heterogeneity limited our ability to conclude a benefit or a lack of a benefit for rehabilitation in other postacute settings for the other conditions in which systematic reviews had been completed. The efficacy of multidisciplinary rehabilitation services has not been systematically reviewed for many of the diagnostic conditions treated in rehabilitation. We did not complete a summary of findings from individual studies.

Conclusions—Given the limitations and paucity of systematic reviews, information from carefully designed nonrandomized studies could be used to complement randomized controlled

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Presented to the State-of-the-Science Symposium on Post-Acute Rehabilitation: Setting a Research Agenda and Developing an Evidence Base for Practice and Public Policy, February 13, 2007, Arlington, VA.

No commercial party having a direct financial interest in the results of the research supporting this article has or will confer a benefit upon the author(s) or upon any organization with which the author(s) is/are associated.

trials in the study of the effectiveness of postacute rehabilitation. Consequently, a stronger evidence base would become available with which to inform policy decisions, guide the use of services, and improve patient access and outcomes.

Keywords

Evidence-based medicine; Rehabilitation; Review [publication type]

The pressure on providers of postacute rehabilitation to deliver clinically effective care will only intensify as cost-containment efforts and requirements for documenting the quality of care increase. Systematically acquired evidence can guide rehabilitation services toward higher quality, effective and cost-efficient care; however, the evidence for certain conditions and rehabilitation settings is better developed than for others. More clearly delineating the evidence of effectiveness will help determine whether certain postacute rehabilitation services produce better outcomes than alternatives. Subsequently, policy-makers, health care administrators, and clinicians might be better informed for making decisions about providing rehabilitation services that help patients attain functional autonomy and a better quality of life (QOL).

Effectiveness implies an evidence base and, although they are occasionally used interchangeably, it is important to distinguish the differences between effectiveness and efficacy. *Efficacy* refers to the impact of an intervention as determined through a clinical trial, and differs from *effectiveness*, which refers to its impact in real world situations.[1] In this review, we will first address efficacy in order to discuss the effectiveness of postacute rehabilitation.

In presenting the state-of-the-science, we summarize the efficacy of postacute rehabilitation and highlight the challenges in conducting randomized controlled trials (RCTs), the criterion standard study design of efficacy research.[2,3] We discuss why RCTs may not be appropriate for investigating all areas of rehabilitation, and provide examples to highlight the value of examining effectiveness with well-designed, nonrandomized trials. We link knowledge gained from existing work and explore the importance of selecting appropriate and meaningful outcomes. We discuss the implications of these findings for clinical practice and health care policy, highlighting recommendations for research investigators, providers of care, and policy-makers. Without a clear understanding of the effectiveness of rehabilitation on patient and health system outcomes, access may become further restricted and postacute rehabilitation services may be at risk of being replaced by long-term care institutionalization.

METHODS

For the purposes of this review, postacute rehabilitation includes rehabilitation services delivered after acute hospitalization that are given either in institutional (inpatient, skilled nursing, or long-term care facilities) or in community-based (outpatient or home health) settings. We limited our analyses to services provided by multidisciplinary teams, including physicians, nurses, and combinations of physical, occupational, and speech and language therapists, but not by any of the individual therapies. To allow for a specific concentration

on therapy-based rehabilitation, we excluded studies of multidisciplinary biopsychosocial rehabilitation programs (psychologic, social, or vocational interventions) and mental health services.

Evidence of Efficacy of Postacute Multidisciplinary Rehabilitation

Systematic reviews of health care interventions generally focus on reports from RCTs because they are regarded as providing the most reliable estimates of effects. Although a limitation of RCTs is the general exclusion of information from nonrandomized study designs and qualitative studies, systematic reviews are considered to be the highest level of evidence,[4] providing the most precise estimate of the efficacy of postacute rehabilitation.[5,6] Therefore, this overview of postacute rehabilitation efficacy is grounded primarily in systematic reviews completed in the last 25 years inasmuch as they may be a better guide than individual articles.

Search Strategy and Selection Criteria

We first searched the Cochrane Database of Systematic Reviews (last searched January 12, 2007), Medline (1966 to December 2006), and CINAHL (1982 to December 2006) for English-language systematic reviews that examined rehabilitation services for adults. Using the search term *rehabilitation*, we identified 167 records in the Cochrane database, 1163 meta-analyses and reviews in Medline, and 226 in CINAHL. The Medline and CINAHL search was further refined using 3 additional search terms. *Therapy* identified 168 records in Medline and 73 in CINAHL, *multidisciplinary* yielded 59 records in Medline and 27 in CINAHL, and a search for *interdisciplinary* produced 30 records in Medline and 7 in CINAHL. Diagnosis-specific reviews of the literature were also explored to identify any additional sources. In summary, we used 12 systematic reviews from the last 25 years to examine the efficacy of multidisciplinary therapy-based post-acute rehabilitation. The majority of those included were published since 2001 and together covered only 5 populations: stroke, brain injury, hip fracture, rheumatoid arthritis, and older adults. After selecting the studies, we extracted information regarding study population, sample size, design, the setting and timing of rehabilitation, interventions, and findings. The information was organized by population and setting of rehabilitation care (table 1). We also consulted clinical practice guidelines, consensus statements, and individual RCTs for conditions without systematic reviews.

Rehabilitation research has grown tremendously, with more than 2000 rehabilitation RCTs performed in the last 25 years referenced in Medline; 50% of those trials were published in the last 5 years. In acknowledging the extent of available literature, it is important to understand that this review is an overview and not exhaustive. There are several diagnostic conditions treated in rehabilitation, including Parkinson’s disease and amputation among others, for which we could find no systematic reviews that examined multidisciplinary, therapy-based rehabilitation. It would be difficult to provide in 1 article a more detailed comparison and summary of findings from individual RCTs and other study designs across all diagnoses seen in rehabilitation.

RESULTS

Summary of Findings on Efficacy

Although there are selection criteria to guide the development and quality of systematic reviews, we had the opportunity to flex these criteria to best address the research question. Of the 12 systematic reviews we evaluated, only 8 made conclusive statements about the efficacy of postacute rehabilitation, and these restricted inclusion primarily to RCTs and only occasionally included nonrandomized designs.[7–14] There is clear evidence of the efficacy of multidisciplinary rehabilitation for certain diagnostic populations and treatment settings.

There was strong evidence supporting the benefits of post-acute rehabilitation for stroke patients. Subjects who received “focused stroke rehabilitation” had better functional outcomes and increased odds of going home.[10] Compared with general medical wards, rehabilitation units reduced the 1 year odds of mortality, death or dependency, and death or institutionalization.[13,14] Studies of the transition from hospital to home with early supported discharge compared with conventional services for patients with mild-to-moderate disability post-stroke, found a significant reduction in length of stay (LOS). Early supported discharge was also associated with improved 3- to 12-month outcomes including activities of daily living (ADLs), satisfaction with services, odds of living at home, and survival, with the greatest benefits from coordinated multidisciplinary early supported discharge.[7] Outpatient therapy-based rehabilitation services were also shown to reduce the odds of ADL decline at 6 months, compared with conventional care or no care.[8]

Homogeneity in systematic reviews is essential for investigators to determine benefit or risk,[15] and only Dekker et al,[16] in their study of stroke patients in outpatient day hospitals compared with various control group designs, reported heterogeneity to be so strong that no conclusions could be made. Although a systematic review has not yet been published for home-based multidisciplinary stroke rehabilitation, a recently published RCT by Ryan et al[17] in the United Kingdom found that older stroke patients who receive more intensive home-based multidisciplinary rehabilitation have greater social participation and QOL at 3 months. In another study,[18] however, home-based programs had less favorable functional outcomes for stroke survivors compared with inpatient multidisciplinary rehabilitation.

There is also strong evidence supporting early postacute rehabilitation and access to outpatient and community-based services for moderate to severe acquired brain injury patients.[11] More intensive rehabilitation was associated with earlier functional gains once the patients were able to participate. There is moderate evidence that outpatient therapy improves function and socialization, and limited evidence that community-based rehabilitation improves function. Specific interventions may not necessarily be beneficial for patients with milder acquired brain injuries. In contrast to the rehabilitation literature on acquired brain injury, which includes stroke and brain damage from several causes, there were too few RCTs of multidisciplinary rehabilitation specifically for traumatic brain injury to draw any conclusions.[19] Turner-Stokes et al were only able to conclude that “the majority of patients with mild traumatic brain injuries make a good recovery.”[11](p9)

Beaupre[20] and Cameron[21] and colleagues reported a similar challenge: there is no clear level 1 evidence (RCT or systematic review) with which to determine the efficacy of multidisciplinary rehabilitation for hip fracture patients. Their reviews were inconclusive because of the heterogeneity across the studies reviewed. In contrast, a systematic review[22] and RCTs[23–25] of interdisciplinary inpatient geriatric rehabilitation for adults with hip fractures have shown benefits of discharge to home, improved physical function at 6 and 12 months, and increased survival rates at 6 months as a result of programs directed by rehabilitation physicians, geriatric nurses, and physical therapists.

Although Vliet Vlieland and Hazes[12] were unable to determine the benefit of outpatient multidisciplinary care over regular care for people with rheumatoid arthritis, or inpatient multidisciplinary care over outpatient multidisciplinary care, short-term inpatient multidisciplinary care resulted in greater reductions in disease activity for up to 1 year than did regular outpatient care. Two systematic reviews[9,26] compared rehabilitation environments irrespective of diagnosis. Ward et al[26] were unable to determine the benefits or risks of the 3 different care environments they studied. Evans et al[9] more narrowly focused on inpatient specialized rehabilitation compared with conventional medical care and found that specialized rehabilitation resulted in an increased likelihood of home discharge and, in the short-term, greater functional improvement and better rates of survival. Three years later, Evans et al[27] published results from an RCT in which patients were randomized to either inpatient rehabilitation or to usual medical services and outpatient follow-up without rehabilitation; as in the previous systematic review,[9] they found no lasting benefit of inpatient rehabilitation. They noted that alternative care or supportive follow-up may be needed to help patients maintain short-term benefits.

Comparison of results within each review was complicated by their heterogeneity. This makes comparison between studies especially difficult.[28,29] The instruments used to measure the outcome,[16,20,26] define the patient population,[16,26] clarify the setting or environments, and characterize the interventions, varied.[12,14,20,26] The variability may have been exacerbated by the quality of studies or by the inclusion of studies from countries with different policies for access, payment, and service delivery. Additionally challenging the systematic review process, particularly in the reviews by Beaupre[20] and Ward,[26] was the diversity of the study designs selected for inclusion, which ranged from RCTs to interrupted time series. The expanded selection criteria and the heterogeneity confounding the systematic reviews may have been unavoidable in order to collect the data that were available to address the primary research question. Furthermore, the lack of systematic reviews that evaluated the efficacy of postacute rehabilitation may be related to difficulties in conducting RCTs in today’s clinical environment.

True experimental design, where subjects are randomly assigned to at least 2 comparison groups, is best able to control for threats to the internal validity that strengthens the basis for statistical inference.[30] This standard for efficacy research, however, has several methodologic challenges.[19,31,32] Designing an RCT with an adequate sample size, appropriate randomization techniques to account for variability in the diagnostic conditions (ie, level of spinal cord injury), and a combination of patient, service and/or system-level outcome measures, is impractical because of the current limitations in rehabilitation research

funding.[2,29,31] In addition, rehabilitation RCTs that study long-term outcomes that occur after treatment may not be appropriate for progressive conditions—such as advanced multiple sclerosis or Parkinson's disease—that inevitably are going to worsen over time regardless of how they are managed.[33] The benefit of multidisciplinary rehabilitation for these conditions, as identified by outcomes measured more proximal to the treatment, should not go unnoticed, however.[34,35]

There are also ethical restraints in using RCTs, particularly with severely affected patients for whom clinicians believe there are no realistic alternative interventions to specialized care.[11,36] Particularly for conditions in which multidisciplinary rehabilitation has become the standard of care without systematic evidence to support it in practice,[31] denying services randomly in order to conduct an RCT could be considered unethical, as has been the case with patients with spinal cord and traumatic brain injuries.[19,37] Thus, at a global health services level, restricting evidence of rehabilitation effectiveness to RCTs, unless they compare standard care to more intensive or specialized rehabilitation, may be unreasonable both ethically and practically. The best alternative may be to either prospectively or retrospectively study the real-world clinical environment using nonrandomized designs appropriately adjusting for selection bias. In doing so, effectiveness studies with high quality nonrandomized designs could be used for more global questions intending, for example, to influence health policy. Several nonrandomized designs are also appropriate for guiding future research in that they identify target populations and appropriate outcomes for measurement and thus establish the foundation for RCTs when necessary. Efficacy studies using RCTs could then be reserved for analysis of specific components of rehabilitation treatment.

Establishing Evidence of Effectiveness in Postacute Rehabilitation Without RCTs

Applying carefully designed, nonrandomized studies can strengthen the evidence to make more conclusive statements about the effectiveness of rehabilitation services and outcomes. In this section, we describe alternative approaches to establishing evidence of effectiveness and highlight published and ongoing work.

The evidence base for effectiveness comes from 2 main types of scientific studies: clinical trials of efficacy and outcomes research.[38] As noted earlier, clinical trials test a treatment group compared with a control group by either randomly assigning patients or comparing populations with nonrandom methods to assess outcomes. In contrast, outcomes research assesses how well the intervention or treatment works in everyday practice settings. Several study designs can be classified as types of outcomes research, including nonrandomized program evaluations and epidemiologic research methods that examine factors that influence the natural course of health and disease in particular groups of patients.

The use of before-and-after or pretest–post-test designs is possibly most common in studies that evaluate rehabilitation services. For example, Trend et al[39] evaluated the short-term effectiveness of intensive multidisciplinary rehabilitation for people with Parkinson's disease and found improvements in mobility, gait, speech, depression, and QOL, with people of more advanced disease at baseline showing more significant gains. Freeman[40] and Di Fabio[41] and colleagues described benefits of multidisciplinary rehabilitation for subjects

with multiple sclerosis as a result of both inpatient rehabilitation[40] and an extended outpatient rehabilitation program.[41]

Several ongoing nonrandomized studies with different designs that are evaluating inpatient rehabilitation and skilled nursing facilities were presented at the State-of-the-Science Symposium. It was recognized that particularly lacking are measurements of the effectiveness of multidisciplinary rehabilitation for people with such conditions as pulmonary disease or cancer. Access to multidisciplinary rehabilitation for such patients is being increasingly restricted by national policy.

Regardless of the type of nonrandomized study, or whether it is classified as clinical or outcomes research, specific principles of research design could be incorporated to improve their scientific rigor. These include blinded assessment, the use of valid, reliable, and relevant measures sensitive to change over time, adequate length and timing of follow-up, and adjustments for selection bias.[3,28,42]

Lack of randomization is a primary challenge to validity. Treatment group comparisons can be biased if the groups are not equivalent with respect to the expected distributions of both known and unknown characteristics associated with treatment group and outcomes.[43,44] Systematic matching using propensity score modeling or other statistical modeling techniques will adjust for factors that are simultaneously associated with referral to both the treatment and control groups. The use of these concepts to reduce selection bias has been used in non-randomized studies in other settings.[45–47]

Few rehabilitation-focused, nonrandomized studies control for selection bias. Kramer et al[48] applied propensity scores to adjust for the association between confounders and outcomes in comparing rehabilitation hospitals, subacute nursing homes, and traditional nursing homes. Consistent with the efficacy studies presented above, stroke patients—but not hip fracture patients—were more likely to return to the community and recover ADLs if they received treatment in a rehabilitation hospital. Rehabilitation hospitals appeared to be more effective than subacute nursing homes, and subacute nursing homes more effective than regular nursing homes, in providing stroke rehabilitation. Coyte et al[49] examined the benefit of alternative postacute settings after joint replacement surgery on acute readmission and the total cost of a continuum of care. After adjusting for the propensity of assignment to 4 postacute discharge destinations, it was found that being discharged to the community with home care services resulted in a greater acute LOS, greater total cost, and higher rates of readmission, whereas going to a rehabilitation hospital resulted in a lower rate of readmissions but at a greater total cost.[49] Adjusting for case mix when examining the influence of 2 or more interventions on an outcome does not necessarily sufficiently reduce the selection bias associated with assignment to each intervention group. Adjusting for the probability of receiving the treatment is essential in nonrandomized studies of the effectiveness of rehabilitation services.

There is a wide range in the quality of both efficacy and effectiveness studies, and inappropriate analyses or presentations of findings can be misleading. Consequently, the strength of conclusions can vary. Improving the quality of effectiveness studies is essential

to supporting clinical practice and health policy. The Transparent Reporting of Evaluations with Non-randomized Designs (TREND) statement[3] provides explicit criteria for addressing the quality of nonrandomized studies in a way that is comparable to the Consolidated Standards of Reporting Trials (CONSORT) statement[50] developed for randomized studies. Both criteria emphasize the transparency of reporting so that the differences and similarities among studies are easily grasped. Comparisons of both criteria suggest that the characteristics that define high quality studies are remarkably similar. Moreover, each type of study has its benefits and drawbacks. Well-designed randomized trials can produce causal inference between an intervention and its outcome(s), but causal inference can never be as certain in evaluation studies. In contrast, well-designed evaluation studies can give a more externally valid picture of the outcomes and effectiveness of alternative services in actual practice.[51] The use of criteria for designing and reporting nonrandomized studies, such as those presented in the TREND statement, could improve the quality of research, just as the CONSORT criteria improved the quality in reporting of RCTs.[52]

Effectiveness of What? Outcomes for Efficacy and Effectiveness Rehabilitation Research

Ultimately, the purpose of postacute rehabilitation is to help patients attain their fullest potential given their physical and/or cognitive limitations, their individual characteristics, and their surrounding environments.[53,54] The breadth of populations served by multidisciplinary rehabilitation, the settings in which rehabilitation is provided, and timing of services, introduce unique challenges to evaluating whether the care is effective. This situation is complicated further by the opportunity to measure so many different but relevant outcomes. Careful selection is essential because the particular outcome measures used to determine effectiveness would influence conclusions about under use and overuse, benefit and harm. Moreover, a highly meaningful intervention may appear meaningless if the wrong outcome measure is selected.

Outcomes that enhance the likelihood of the patient's transition from hospital to home or to the community are particularly beneficial to the patient and to society through enhancements of patient autonomy and decreases in long-term care costs. These might include sensory, physiological, emotional, social, vocational, satisfaction, or community participation measures. Depending on the patient population or phase of recovery, measures of depression, anxiety, or perceived stress could be important indicators of adjustment in postrehabilitation studies. Other meaningful factors that rehabilitation clinicians should consider include stigma, motivation, empowerment, and self-acceptance. These factors can have life changing effects on people and on their ability to gain and maintain independence. Unfortunately, these factors are rarely addressed, seldom measured, and are difficult to quantify in postacute rehabilitation.

Conceptual models of disability, including the *International Classification of Functioning, Disability and Health*[55] and Nagi's[56] disablement model, have been used to guide the selection of outcomes for rehabilitation studies and to define the factors that may potentially influence the outcome. The use of different terminology for overlapping concepts in these and other models adds to the heterogeneity when summarizing across studies of effectiveness. The terminology from these models has been related to others to develop an

expanded biopsychoecologic framework for conceptualizing outcome measurement.[57] Concepts and terms are related through less explicit interactions involving the mind, body, society, and environment. Specifically, the biopsychoecologic model views disability as arising through interactions where outcomes occur at the intersection of the person (body and mind), and his/her physical and sociocultural environments.[58] When treatment effectiveness is viewed through the biopsychoecologic framework, factors relevant to the contexts of life experience may be just as important to enhancing patients' abilities to perform and participate in daily activities as formal rehabilitation therapy.

The outcome, explanatory variables, and application of the findings need to be determined during the study's development, with input from all decision-makers, be it the patient, family, health provider, health system administrator, or policy analyst. This collaborative approach to determining the most appropriate methods and measures for studying effectiveness is common among investigators who design clinical and health service research in which clinicians, patients, or health system administrators are often involved; however, such efforts less frequently involve policy decision-makers.

DISCUSSION

Policy Directives

Higher quality evidence of effectiveness is being sought by all decision-makers in order to make rational and informed decisions about care. Unfortunately, in some cases, the health system has evolved based on opinion rather than evidence. For example, the 3-hour rule was constructed in the United States by the Centers for Medicare & Medicaid Services as a threshold to establish the need for inpatient rehabilitation; although this level of intensity has not been evaluated, it has gained such general acceptance that it is an essentially unquestioned part of rehabilitation services because of a related compliance measure for inpatient rehabilitation facilities. This example of external influence on, and opinion about, service delivery without a clinical foundation or evidence of effectiveness is not an isolated example.

Several policies developed primarily for cost containment dictate what patients can be treated in what setting, at what intensity, and for what duration. The 75% rule, local coverage determinations, the outpatient therapy cap, and private health insurance coverage, each constrain access and limit coverage for services. These issues are not limited to policies in the United States. Fixed payments for rehabilitation care are being implemented in other countries for the purpose of capping costs, irrespective of clinical needs for treatment.[59,60] Yet, there is little empirical evidence to support these decisions.

If cost is the primary outcome and cost containment the primary objective, what secondary effect is there on patients as access to services is diminished? Although the shift in utilization is measurable,[61] the impact of these policies on health outcomes is more difficult to quantify. Administrative records of those who did not undergo rehabilitation do not include sufficient data elements for comparison. Natural experiments using nonrandomized study designs are needed to evaluate these policies and to determine the associated benefit or harm to patients and the system. Strong evidence on the effectiveness of rehabilitation for

specific populations, particularly where research is lacking, may help shift the characteristics of existing regulations, and better direct decision-makers in the development of future health care policies. Without additional financial resources, policy-makers could become more involved by identifying and prioritizing important unanswered clinical research questions.

Clinical Practice Directives

Standardized measures of effectiveness need to be developed and that development can begin in clinical practice. An administratively driven data collection system must be in place in postacute care settings that includes standard measures appropriate for studying processes of care and outcomes. Such a system is necessary for the requisite formal studies on effectiveness in clinical practice. This would allow decision-makers at all levels to reflect on the quality of rehabilitation care that was provided and identify opportunities for change and improvement. Practitioners and health systems administrators should be continuously monitoring the results of the care that is provided and using that information to improve care for all patients. Such a system would enable evidence-based practice and make possible a better understanding of the outcomes that best define effective and ineffective care. Without such a system, programs designed to improve quality, such as pay for performance models, may result in incentives for ineffective care. The development of such a data collection system should involve clinicians and researchers who can use clinical data to establish scientific protocols. The academic base of clinician researchers needs to be expanded to support a greater volume of effectiveness research across and within alternative rehabilitation settings.

Research Implications

A clearer understanding of the effectiveness of multidisciplinary rehabilitation may be possible if several strategies are adopted. First, research would benefit from guidelines that indicate when RCTs are more appropriate than nonrandomized study designs, and the strategies that are available for strengthening study methodology. Second, research is needed that focuses on the patient populations for who access is being restricted. This may advance the field of physical medicine and rehabilitation and related policies by better defining the clinical characteristics that determine which of the different types and levels of rehabilitative services are needed. Third, research on the continuity of rehabilitation care, particularly in transition from inpatient to community-based care, may uncover gaps in service needs and interventions to improve patients' success with community reintegration. Finally, research findings must be disseminated widely through both rehabilitation and nonrehabilitation journals to improve the visibility and recognition of the scientific basis of our practices among our clinical, policy, and academic peers.

CONCLUSIONS

This review of the effectiveness of postacute rehabilitation aimed to synthesize the state-of-the-science in an effort to rehabilitate rehabilitation research on the effectiveness of care. Policy and health care decision-makers need accurate and appropriate information to ensure that the most feasible and beneficial services are in place for patients in need. Decisions about coverage and access should not be made as arbitrarily as appears to have been the case

with many national policies. Recognizing the practical and ethical obstacles to submitting all populations that are receiving rehabilitation to RCTs, many important policy decisions will need to be based on outcomes research of effectiveness, including program evaluations. Adopting standards such as the TREND criteria for nonrandomized study designs could improve the quality of research and allow investigators to choose the methodologic designs that are most rigorous. Giving close attention to the views of rehabilitation stakeholders can help investigators select outcomes that are most appropriate for the questions being asked and the audience who will use the findings. More clearly delineating the effectiveness of postacute rehabilitation can help cost containment efforts in ways that maximally minimize the loss of meaningful services and thus reduce the potential harm to patients. Collaborative efforts among academicians, policy-makers, clinicians, and patients are necessary to ensure that resources are applied in the most appropriate ways to enhance the lives of people with disabilities in the United States.

Acknowledgments

Supported in part by the National Institute of Child Health and Human Development and the National Center for Medical Rehabilitation Research (grant no. T32-HD-007425).

The contents of this article are solely the responsibility of the authors and do not necessarily represent the official views of the National Institutes of Health.

We thank Allen W. Heinemann, PhD, for guidance in developing this manuscript, and the reviewers for their constructive input.

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Arch Phys Med Rehabil. Author manuscript; available in PMC 2015 January 29.

Table 1

Overview of Systematic Reviews Organized by Population and Along the Postacute Care Rehabilitation Continuum

Study	Review	Population	Setting and Treatment	Control	Findings
Ottenbacher and Jannell[10]	36 clinical trials (N=3717)	Stroke	Focused stroke rehabilitation (4 types, including team)	Comparison groups	Focused stroke rehabilitation improved functional performance. Improvement seemed related to early initiation of treatment and not to the duration of the intervention.
Stroke Unit Trialists' Collaboration[13]	18 trials (RCTs, QRTs) (N=3249)	Stroke	Inpatient rehabilitation stroke units	General medical wards	Combined acute and rehabilitation stroke units, rehabilitation stroke units, and mixed assessment (not just stroke) rehabilitation units were more effective than conventional care provided in a general medical ward. Reduced odds of mortality, death or dependency, and death or institutionalization.
Langhorne and Duncan[14]	9 RCTs (N=1437)	Stroke	Inpatient multidisciplinary stroke care	Inpatient nonmultidisciplinary or inpatient multidisciplinary in a general ward	Inpatient multidisciplinary stroke care resulted in decreased odds of death, death or dependency, and death or institutionalization.
Early Supported Discharge Trialists[7]	11 RCTs (N=1597)*	Stroke	ESD from hospital to home	Conventional services	ESD showed significant reductions in LOS; reduced likelihood of death or institutionalization and death or dependency; improved extended ADLs, satisfaction with services, and odds of living at home; greatest benefits with coordinated multidisciplinary ESD.
Outpatient Service Trialists[8]	14 RCTs (4 were multidisciplinary) (N=1617)	Stroke patients living at home	Outpatient therapy-based rehabilitation services	Conventional or no care	Reduced the odds of deteriorating in ADLs, increasing the ability to undertake ADLs within 1 year of acute hospitalization.
Dekker et al[16]	15 articles reporting on 7 RCTs (N=1033)	Stroke	Outpatient day hospital rehabilitation	Various	No conclusive evidence because of the heterogeneity of studies (definition of treatment and control groups, different study populations, and the variety of measurement instruments used).
Turner-Stokes et al[11]	10 RCTs, 3 QRT/CCTs, 1 QED (N=1814)	Acquired brain injury in young adults (16–65y)	Inpatient, outpatient, and community-based multidisciplinary rehabilitation	Routinely available local services or lower levels of intervention	Strong evidence for moderate to severely injured patients to receive early postacute care rehabilitation and access to outpatient and community-based services. Moderate evidence that outpatient therapy improves outcomes (FIM, ADLs, socialization). Limited evidence that community-based rehabilitation can improve functional outcomes. Strong evidence that more intensive rehabilitation is associated with earlier functional gains once patients are fit to engage. Other than provision of

Study	Review	Population	Setting and Treatment	Control	Findings
					appropriate information, specific interventions are not necessarily appropriate information, specific interventions are not necessarily appropriate information, specific interventions are not necessarily
Cameron et al[21]	9 RCTs and QRTs (N=1887)*	Hip fracture (65+y)	Coordinated inpatient multidisciplinary rehabilitation	Usual orthopedic care	No conclusive evidence, but there is a trend toward greater benefits in all main outcomes, particularly combined outcomes of death or deterioration in function and death or institutionalization. There was considerable heterogeneity in LOS and cost.
Beaupre et al[20]	50 level 1 RCTs and systematic reviews, and level 2 high quality observational studies (N=NA)*	Hip fracture Elderly	Multidisciplinary several settings (home care, subacute, rural vs urban, outpatient)	Usual care	Lacked sufficient evidence to determine either the benefit or harm of postsurgical practices. Effect of multidisciplinary care compared with usual care postoperatively is unclear. There is little evidence to determine clear benefit among different rehabilitation settings or timing of rehabilitation in terms of patients' functional outcomes and service utilization.
Vliet Vlieland and Hazes[12]	9 RCTs, 6 CCTs Conditions 1,2 = 6 studies each Condition 3 = 3 studies (N=1038)	Rheumatoid arthritis	**1** Inpatient multidisciplinary **2** Outpatient multidisciplinary **3** Inpatient multidisciplinary	**1** Outpatient routine care **2** Outpatient multidisciplinary **3** Inpatient multidisciplinary	Short-term inpatient multidisciplinary care compared with regular outpatient care results in a more favorable effect on disease activity. Benefits are inconclusive for outpatient multidisciplinary over regular care, and inpatient multidisciplinary over outpatient multidisciplinary care.
Evans et al[9]	9 RCTs and 2 nonequivalent control group designs (N=2183)	Rehabilitation of any disabling diagnosis (8 stroke, 3 geriatric)	Inpatient specialized rehabilitative care	Conventional medical care	Inpatient specialized rehabilitation was significantly associated with improved function during the hospital stay, better rates of survival, and increased likelihood of returning home and remaining at home.
Ward et al[26]	RCTs, CCTs, CBAs, interrupted time series were considered (N=NA)	Adults (60+y)	Care home environments (residential care home, nursing home or facility)	Hospital environments and own home environments	No conclusive evidence because of the heterogeneity of the studies (description of the environment, specification of the components of the rehabilitation system, incomparable treatment and control groups, patient characteristics, clinician skill mix, and academic status of care environment).

NOTE. Cochrane protocols for systematic review have been published for: (1) multidisciplinary rehabilitation for adults with multiple sclerosis by Khan et al[62]; (2) multidisciplinary rehabilitation interventions for joint replacement at the knee and hip for arthropathies by Khan and Disler[63]; and (3) therapy-based rehabilitation services for patients living at home more than 1 year after stroke by Aziz et al.[64]

Abbreviations: ADLs, activities of daily living; CBA, controlled before and after studies; CCT, clinical control trial; ESD, early supported discharge; FIM, Functional Independence Measure; LOS, length of stay; NA, not available; QED, quasi-experimental design; QRT, quasi-randomized trial.

* Review did not include any studies from the United States.