Factors Affecting Length of Stay in Adult Outpatient Physical Rehabilitation: A Scoping Review of the Literature

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ABSTRACT

Purpose: To identify factors affecting length of stay (LOS) for adults participating in outpatient physical or occupational therapy programmes. **Method:** A scoping review of the literature was conducted using the Ovid MEDLINE, EMBASE, CINAHL, AMED, and Cochrane Library databases. **Results:** A total of 19 articles were retained from the search, and 2 additional articles were retrieved from grey literature (i.e., non-published sources). Personal factors affecting LOS are age and sex, both of which had inconsistent effects on LOS, and communication, language, physical, and cognitive difficulties, for which higher levels of function were generally associated with shorter LOS. Institutional factors affecting LOS were location, interdisciplinary communication, number of disciplines involved, and type of rehabilitation setting. Finally, two clinician-related factors—fewer treatment goals and a selection of evidence-informed treatment techniques—were associated with shorter LOS. **Conclusions:** Research on factors affecting adult outpatient rehabilitation LOS is limited and inconsistent. A preliminary list of LOS factors was produced, but this topic should be further explored with the collaboration of researchers and clinical institutions.

Key Words: length of stay; outpatients; rehabilitation.

RÉSUMÉ

Objet: Déterminer les facteurs qui ont un effet sur la durée du séjour (DDS) chez les adultes participant à des programmes de physiothérapie ou d'ergothérapie en service externe. **Méthode:** On a effectué une recherche documentaire dans les bases de données Ovid MEDLINE, EMBASE, CINAHL, AMED et Cochrane. **Résultats:** Au total, la recherche a produit 19 articles qui ont été retenus et deux autres ont été extraits de la littérature grise (c.-à-d. de sources non publiées). Les facteurs personnels qui ont un effet sur la DDS sont l'âge et le sexe, qui avaient tous deux des effets non uniformes sur la DDS, ainsi que la communication, la langue, les problèmes physiques et cognitifs dans le cas desquels on établissait en général un lien entre des niveaux plus élevés de fonctionnement et une DDS plus courte. Les facteurs institutionnels qui ont un effet sur la DDS sont le lieu, la communication interdisciplinaire, le nombre de disciplines en cause et le type de contexte de réadaptation. Enfin, on a établi un lien entre deux facteurs liés aux cliniciens—objectifs de traitement moins nombreux et sélection de techniques de traitement éclairées par des données probantes—et une DDS plus courte. **Conclusions:** La recherche sur les facteurs qui ont un effet sur la DDS en réadaptation en service externe chez les adultes est limitée et incohérente. On a produit une liste préliminaire de facteurs de la DDS, mais il faudrait explorer la question plus à fond avec la collaboration de chercheurs et d'établissements cliniques.

Beyond the possible psychosocial and economic impacts for patients, length of stay (LOS) in outpatient rehabilitation is an important consideration in maintaining the cost effectiveness of rehabilitation services. A short LOS in rehabilitation is likely to result in substantial cost

savings for the health care system,¹ but these savings must not come at the expense of effective patient care. Longer LOS, though, is likely to contribute not only to greater per-patient costs but also to longer wait times before admission for other patients, a factor associated

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with poorer functional outcomes and an increased number of medical complications.² It is important for patients and health care systems alike, therefore, to better understand what factors contribute to LOS in outpatient rehabilitation.

The National Rehabilitation Reporting Systems, a branch of the Canadian Institute for Health Information, has recorded annual statistics on LOS and wait times in Canadian inpatient rehabilitation facilities since 1995,³ but it does not provide information on outpatient services. The same lack of information characterizes the scientific literature, in which studies of factors affecting LOS have focused on the inpatient setting.⁴ To our knowledge, there is presently no summary study examining the factors that influence LOS in outpatient rehabilitation.

Our objective in this study, therefore, was to conduct a scoping review of the literature to determine whether information exists that describes factors affecting LOS for adults participating in outpatient physical rehabilitation. Our primary aims were to assess the breadth of the literature on this topic and to provide a comprehensive summary of factors identified through this review. Depending on the nature of the information gleaned from the literature, we also aimed to provide recommendations for future work on this topic. For the purposes of this review, we defined LOS as the number of days between admission to and discharge from the rehabilitation facility, excluding any service interruptions.⁵ We defined physical rehabilitation as services provided by a physical therapist or occupational therapist for a primary health condition that is physical in nature.⁵

METHODS

The methodology for the scoping review was based on the framework described by Arksey and O'Malley⁶ and by Levac and colleagues.⁷ The general purpose of a scoping review is to assess, in broad terms, what research is available on a given topic of interest. The available information is summarized and charted via text, tables, and graphs, but no in-depth analysis or evaluation of the quality of the included research studies is conducted. Operationally, a scoping review's findings will educate policymakers in their decisions, guide systematic review writers regarding the viability of a topic, and orient researchers to current gaps in knowledge.

We searched five electronic databases: Ovid MEDLINE, EMBASE, CINAHL, AMED, and the Cochrane Library. We also searched the reference lists of all review-type articles (but not articles of other types) identified through the database searches for potentially relevant articles. Finally, we retrieved references on the basis of our existing knowledge of the grey literature (i.e., non-published sources) and conducted a brief Google search using the terms *length of stay* and *physical rehabilitation*.

We used the following research question to guide the literature search: "For adults participating in an outpatient physical rehabilitation programme, including physical and/or occupational therapy, what are the factors affecting LOS?"

Identifying relevant studies

The search strategies used for the five electronic databases were developed with the assistance of a research librarian. (A detailed table of the entire search strategy, including the exact search terms and variations used for each electronic database, may be obtained from the authors on request.) The search strategy and terms were initially designed for Ovid MEDLINE and then modified for all other databases. Predetermined search terms were chosen to broadly represent the combined concepts of LOS and physical rehabilitation. All databases were searched from their earliest records; our final search strategy was executed on December 4, 2012. The results of the searches were organized using EndNote X6 (Thomson-Reuters, New York, NY).

Study selection

After removing duplicates, we divided all articles extracted from the five databases into three separate folders (alphabetically by first author) and assigned each to a team of two researchers for review. Figure 1 shows the three phases of article screening.

In phase 1 (screened by title), each researcher independently included or excluded articles on the basis of the study's title; the two researchers then reconvened to compare their lists of included and excluded studies. In case of disagreement, a third researcher mediated discussions until a consensus was reached. A similar method of comparison was used in phases 2 (screened by abstract) and 3 (screened by article content), which involved, respectively, reviewing study abstracts and full-text articles. Full-text articles were retrieved through electronic databases, library holdings, and interlibrary loans.

Studies were excluded if they dealt exclusively with a pediatric population (aged <18 y) or with data from a rehabilitation setting other than physical rehabilitation (e.g., substance abuse, mental health, speech-language); inpatient settings exclusively; home-care services; treatment programmes that did not involve either occupational or physical therapy (e.g., surgical, pharmaceutical); or preoperative treatment only (i.e., having a preset end date of treatment). A detailed list of inclusion and exclusion criteria applied at each phase of study selection is available from the authors on request. Studies were also excluded if they did not investigate LOS or were in a language other than English or French or if the study design implied a level of evidence considered too low in quality (e.g., expert opinion paper, editorial, newsletter, single-case study).

Figure 1 Triage process flowchart.

Charting the data

After phase 3 of the study selection process (see Figure 1), we extracted and charted specific data from each of the retained studies. Within the pairs assigned to each of the three data folders, each researcher independently extracted the following information from each study: authors, title, year and country of publication, patient population (health condition, sex, mean age), number of study participants, study design, study objectives, and outcomes related to LOS. Each pair of researchers then compared their results for agreement, and a third researcher was included to reach consensus in the case of any discrepancies in the extracted data.

RESULTS

As illustrated in Figure 1, the combined search of five electronic databases yielded 11,808 articles. After removal of duplicates, the remaining 8,566 articles were divided between three pairs of researchers for study selection. Of these, 4,166 were excluded on the basis of title (phase 1), and a further 4,119 were excluded on the basis of abstract content (phase 2), leaving 281 full-text articles to be examined in phase 3. Of these, 73 could not be retrieved; however, in the absence of full text, any sufficiently detailed abstract was considered for data extraction. Although abstracts cannot be assumed to be completely representative of their full-text counterparts,⁶

Figure 2 Reasons for exclusion of full-text articles.

they were nonetheless useful for the general purpose of this scoping review, in that they captured in broad terms any accessible relevant data that existed. A further 186 articles were excluded on the basis of our inclusion and exclusion criteria (see Figure 2 for details), leaving 19 articles retained from the initial search; of these, 3 were available only as abstracts.^{8–10}

Only 1 systematic review article was examined in phase 3 of the study selection process.⁴ The information in this article did not match the inclusion criteria for the current review, and its reference list did not yield any articles that met our inclusion or exclusion criteria. We retrieved 2 additional references on the basis of our existing knowledge of the grey literature.^{11,12} Thus, at the end of the three-phase study selection process, 21 studies were retained. Data extracted from these 21 articles were organized in a condensed data charting form (available from the authors on request; see Appendix 1). Of the 21 articles, 18 were cohort studies, 1 was a cross-sectional study, 1 was a case-control study, and 1 was a quasi-experimental study. Eighteen studies addressed possible patient factors that influence LOS, 4 addressed institutional factors, and 3 investigated clinician-related factors. A descriptive, numerical summary of the retained studies is presented in Appendix 1; Appendix 2 gives a preliminary list of LOS factors.

Factors affecting LOS

On the basis of the literature, we identified 11 unique factors that affected LOS for adults participating in an outpatient physical rehabilitation programme, although for certain factors impact on LOS was inconsistent between studies. We classified these 11 factors as patient related, institutional, or clinician related; they are summarized in Box 1.

Patient-related factors

Age: Three studies identified age as a factor affecting LOS in outpatient physical rehabilitation, but their findings varied, which suggests that age may interact with other factors such as the condition targeted by the treatment or the number of treatment goals set by the treating clinician. Grimmer and May¹³ reported that people aged 75 years or older were likely to stay longer in outpatient rehabilitation than those aged between 17 and 74 years. Their study's patient population was relatively large (360 patients), but no medical condition was specified, which suggests that these patients may have been undergoing physical rehabilitation for a variety of conditions. Conversely, Gandhi and colleagues¹¹ found a negative correlation between age and LOS for people with stroke, and Dionne and colleagues¹⁴ found no significant relationship between age and LOS for people with chronic low back pain resulting from occupational injury.

Sex: Studies assessing sex and LOS also had mixed results, although most found no relationship. In a data extraction survey by De Feo and colleagues,¹⁵ women with cardiovascular disease underwent a longer rehabilitation period than men. Brennan and colleagues⁸ initially found a similar relationship after shoulder surgery, but a subsequent report by the same group found no impact of sex on LOS during physical therapy rehabilitation in this population.¹⁶ Other studies also found no effect of sex on LOS in people with stroke¹¹ or in people with thoracic or low back pain.^{9,14}

Language or communication difficulties: Only one study addressed the effect of language and communication on LOS.¹³ This study found that people with speech or hearing impairments and those who did not speak the

Box 1 Preliminary List of Length of Stay (LOS) Factors

Category	Factor
Patient factors	<ol style="list-style-type: none"> 1. Age – mixed findings, likely as a result of interaction with other factors 2. Sex – no clear relationship; possible interaction with other factors 3. Language and/or communication difficulties – generally associated with longer LOS 4. Level of function – high function was generally associated with shorter LOS 5. Physical diagnosis and comorbidities – neurological conditions generally associated with longer LOS than orthopaedic or musculoskeletal conditions; comorbidity, especially cognitive deficits, generally associated with longer LOS
Institutional factors	<ol style="list-style-type: none"> 6. Location of rehabilitation centre – LOS was longer in urban than in rural centres 7. Rehabilitation setting – apparent interaction with condition and other institution-specific factors 8. No. of disciplines involved in care – higher number may increase LOS 9. Institutional interdisciplinary communication programme – improved communication and documentation may shorten LOS
Clinician factors	<ol style="list-style-type: none"> 10. Choice of treatment technique – evidence-informed treatment may shorten LOS 11. Total number of treatment goals – increased number of treatment goals may increase LOS

native language of where the institution was located had longer LOS than people without these difficulties.

Level of function: Higher levels of function tended to be associated with shorter LOS in outpatient physical rehabilitation. The studies used a variety of measures, however, which made a direct comparison between studies difficult. Of the studies reviewed that investigated the association between patient function and LOS, only Hoenig and colleagues¹⁷ did not find a significant relationship. The patient populations involved in this study were people with multiple sclerosis and spinal cord injury. The Self-Reported Functional Measure (a tool derived from the FIM) was used as a measure of functional independence. The remainder of the retained studies were conducted with people with stroke and associated higher levels of function with shorter LOS. Mackenzie and colleagues¹⁸ found a positive correlation between LOS and the Sickness Impact Profile. Gandhi and colleagues¹¹ found a positive correlation between the total number of functional problems on admission and LOS. Huang and colleagues¹⁹ found that Barthel Index scores (where a higher score indicates greater functional independence) at 1 month post-stroke were negatively correlated with LOS. Bates and Stineman used FIM scores to group people with stroke as severely, moderately, or mildly disabled.²⁰ People with severe disability had the longest LOS; those with mild disability had the shortest.

Physical diagnosis and comorbidities: Two studies found that adults undergoing outpatient physical rehabilitation for neurological conditions, including stroke, tended to have longer LOS than those with orthopaedic or musculoskeletal conditions,^{12,21} and this was true for both single-service and inter-professional programmes. Galski and colleagues²¹ also found that people with stroke were prescribed significantly more weekly hours of outpatient therapy than those in an orthopaedic cohort.

Different neurological conditions, as well as associated impairments and comorbidities, are also likely to lead to different LOS in outpatient physical rehabilitation.

Schwartz and colleagues²² observed a significantly longer LOS for people with a spinal cord injury than for people with a traumatic brain injury (TBI). Furthermore, those who had sustained their injury during a terrorist attack or who had post-traumatic stress disorder tended toward a longer LOS. Among people with TBI, agitation was also found to increase LOS.²³ Fever after TBI, with or without additional non-neurological injuries (e.g., fractures, organ damage), may also prolong LOS, although these findings did not reach statistical significance.²⁴ Finally, Galski and colleagues²¹ found that impairments in higher order cognitive functions after stroke, such as the ability for conceptualization, short-term memory, and constructional ability, led to increased outpatient referrals and hours of treatment. Grimmer and May¹³ also reported longer LOS in people with cognitive impairments.

In orthopaedic and musculoskeletal patient populations, specific diagnosis and severity of the condition were also found to affect LOS in outpatient rehabilitation. Among people with thoracic spine pain, the presence of a compression fracture was associated with longer LOS, although only by a small margin.⁹ For people with low back pain, those who had experienced at least two episodes severe enough to warrant 2 or more weeks' sick leave from work also had longer LOS than those who did not meet this criterion.¹⁴ Different types of shoulder surgery were also found to warrant different LOS.⁸ In people with lower limb amputation, those with a transfemoral amputation warranted a shorter LOS than those with a transtibial amputation.²⁵ Hunter and colleagues¹⁰ reported a higher number of visits among people with knee and shoulder conditions than with thoracic, cervical, and lumbar conditions.

Institutional factors

Location of the rehabilitation centre: Grimmer and May¹³ found that people undergoing occupational therapy treatment in metropolitan hospitals were substantially more likely (odds ratio, 8.9; 95% confidence interval,

1.7–14.9) to have a longer LOS than those treated in rural settings.

Rehabilitation setting: In the Greater Toronto Area (GTA), average LOS in outpatient physical rehabilitation was found to vary somewhat between rehabilitation settings.¹² For people receiving outpatient musculoskeletal rehabilitation, the average LOS was shortest in acute teaching hospitals, longer in acute community hospitals, and longest in rehabilitation centres.

For those receiving neurological (including post-stroke) rehabilitation, the GTA Rehab Network report¹² found a large variance in average LOS, likely because the sample included certain specialty clinics with inherently long LOS. Thus, average LOS was shortest in acute community hospitals (even shorter than for musculoskeletal conditions), longer in rehabilitation centres, and longest in acute teaching hospitals (with substantially longer LOS for the last two settings, well beyond the average LOS for musculoskeletal conditions in similar settings).

Number of disciplines involved in care: Gandhi and colleagues¹¹ assessed the impact on LOS of having multiple disciplines involved in patient care, often including disciplines beyond physical or occupational therapy. They found a moderately positive correlation between the total number of disciplines involved with a patient and LOS.

Interdisciplinary communication programme: Beckerman and colleagues²⁶ studied whether the Rehabilitation Activity Profile—a programme intended to improve interdisciplinary communication, including a structured method to document patient information—would produce better rehabilitation outcomes and shorter LOS. Although the programme was only partially implemented for the outpatients in this study, LOS for those in the programme was roughly half that of the group for whom the programme was not used at all.

Clinician-related factors

Choice of treatment technique: The two studies that specifically assessed how choice of treatment technique affected LOS found a strong effect. Fell²⁷ found that including mental practice along with the usually prescribed physical exercises after total knee arthroplasty resulted in significantly shorter LOS. Fritz and colleagues²⁸ found similar outcomes with the inclusion of spine manipulation in addition to usual orthopaedic treatment techniques for people with occupational low back pain. In this case, average physiotherapy LOS was reduced from 17 days to 12.

Number of treatment goals: Gandhi and colleagues¹¹ found a moderate but significant correlation between the total number of treatment goals and a patient's LOS, which suggests that LOS tends to increase along with an increase in the number of treatment goals.

DISCUSSION

The most telling finding of our scoping review is the scarcity of data on factors that affect LOS in outpatient physical rehabilitation. We found only 21 studies that examined this topic in any fashion, and most of these assessed LOS as a secondary variable, providing only limited analysis and discussion. In contrast, a wealth of literature and government-funded statistics (e.g., from the Canadian Institute for Health Information) examined similar factors for inpatient populations. Box 1 summarizes the factors identified as affecting LOS in adult outpatient physical rehabilitation.

Recommendations

Our findings make it clear that a better understanding and analysis is needed of factors that affect LOS in outpatient physical rehabilitation. This scoping review may provide researchers with a starting point for further study of this topic. Because little information could be gleaned from the literature, however, and because of the inconsistent objectives and methodologies of the studies retained in this scoping review, we suggest that future work should also use expert opinion and consultation with stakeholders (e.g., rehabilitation centres and networks) to help determine the direction of future primary research. We also believe that future research would be facilitated by access to more complete electronic medical records and by more standardized patient assessment within and between institutions. The lack of consistency among studies in how certain factors are measured (e.g., level of function) makes synthesizing findings across studies difficult. A variety of study designs may be appropriate for future primary research, although longitudinal prospective observational cohort studies seem likely to be most useful.

Our findings related to the effect of physical diagnosis on LOS also suggest that future studies should target more homogeneous patient populations, based on diagnosis (e.g., arthroplasty, stroke) or more general categorization (e.g., orthopaedic, neurological, cardiorespiratory). Factors that may be universal across these patient groups can then be examined post hoc.

Finally, our findings suggest that certain factors related to LOS (e.g., age, functional level, number of treatment goals) may interact. Future studies should therefore account for such interactions in their statistical analyses.

Limitations

The most evident limitation of this scoping review is that we were able to examine only a portion of the information that may be available globally: Only studies written in English and French were considered, and some studies (which may or may not have contained relevant information) could not be retrieved as full-text

articles. Our review also excluded the numerous studies that have examined the relationship between factors such as specific treatment technique and LOS in inpatient populations. The extent to which such findings can be generalized to the outpatient population, however, remains to be determined. A complete assessment of the grey literature was also deemed unfeasible; therefore, the data presented in this article are limited to the results of a short exploratory effort and should not be regarded as fully representative of the grey literature. It is also important to note that scoping reviews have inherent limitations, such as lack of critical appraisal of the selected articles and lack of statistical analysis.^{6,7} In all likelihood, however, these limitations do not affect the overall conclusion of this review: that very little information is currently available on factors affecting LOS in outpatient physical rehabilitation.

CONCLUSION

The evidence of factors that influence outpatient rehabilitation is limited and inconsistent. A preliminary list of factors affecting LOS was produced. Further research on this topic is required, with the collaboration of researchers and institutions.

KEY MESSAGES

What is already known on this topic

No summary information is currently available in the literature on factors affecting outpatient physical rehabilitation length of stay (LOS), although this topic has been extensively tracked and studied in the inpatient setting.

What this study adds

This scoping review exposes the dearth of available evidence on factors affecting LOS in outpatient physical rehabilitation. The nature and content of the current available evidence is summarized, along with a preliminary list of 11 factors that affect LOS, categorized as patient-related, institutional, or clinician-related factors. This literature review serves as a starting point for future primary research in this field.

REFERENCES

1. Saxena SKS, Ng TP, Yong D, et al. Total direct cost, length of hospital stay, institutional discharges and their determinants from rehabilitation settings in stroke patients. *Acta Neurol Scand*. 2006;114(5):307–14. <http://dx.doi.org/10.1111/j.1600-0404.2006.00701.x>. Medline:17022777
2. Collins NJ, Crossley KM, Darnell R, et al. Predictors of short and long term outcome in patellofemoral pain syndrome: a prospective longitudinal study. *BMC Musculoskelet Disord*. 2010;11:11. <http://dx.doi.org/10.1186/1471-2474-11-11>.
3. Canadian Institute for Health Information. Introduction to the National Rehabilitation Reporting System [Internet]. Ottawa: The Institute; c1996–2014 [cited 2012 Dec 2]. Available from: http://www.cihi.ca/CIHI-ext-portal/internet/en/document/types-of-care/hospital+care/rehabilitation/services_nrs_intro.
4. Peiris CL, Taylor NF, Shields N. Extra physical therapy reduces patient length of stay and improves functional outcomes and quality of life in people with acute or subacute conditions: a systematic review. *Arch Phys Med Rehabil*. 2011;92(9):1490–500. <http://dx.doi.org/10.1016/j.apmr.2011.04.005>. Medline:21878220
5. Canadian Institute for Health Information. Inpatient rehabilitation in Canada 2006–2007. Ottawa: The Institute; 2008.
6. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *Int J Soc Res Methodol*. 2005;8(1):19–32. <http://dx.doi.org/10.1080/1364557032000119616>.
7. Levac D, Colquhoun H, O'Brien KK. Scoping studies: advancing the methodology. *Implement Sci*. 2010;5(1):69. <http://dx.doi.org/10.1186/1748-5908-5-69>. Medline:20854677
8. Brennan GP, Parent E, Cleland J. Clinical outcomes and utilization of physical therapy services of patients related to categories of shoulder surgeries [abstract]. *J Orthop Sports Phys Ther*. 2008;38(1):A19.
9. Magel J, Brennan G, Fritz J. Description of clinical outcomes and utilization of physical therapy services of patients with thoracic spine pain [abstract]. *J Orthop Sports Phys Ther*. 2011;41(1):A14.
10. Hunter SJ, Brennan GP, Fritz JM. Outpatient physical therapy utilization and outcomes for Medicare beneficiaries with orthopedic conditions [abstract]. *J Orthop Sports Phys Ther*. 2010;40(1):A34.
11. Gandhi M, Karunaratne N, Vaccariello R, et al. Factors that influence length of stay in an out-patient rehabilitation center for patients with stroke. In: Abstracts of the Canadian Physiotherapy Association Congress 2013; 2013 May 23–26; Montreal, QC, Canada. Ottawa: Canadian Physiotherapy Association; c2013 [cited 2012 Dec 2]; p. 71. Available from: http://www.physiotherapy.ca/getmedia/72a03e0d-d71f-4136-8dd6-f0e053fe5907/BookofAbstract2013_25012013.pdf.aspx.
12. GTA Rehab Network. Outpatient rehabilitation in the GTA: understanding the current state [Internet]. Toronto: GTA Rehab Network; c2011 [cited 2013 Jun 17]. Available from: <http://www.gtarehabnetwork.ca/uploads/File/reports/report-outpatientrehab-june2011.pdf>.
13. Grimmer K, May E. Cost drivers of public hospital occupational therapy outpatient care. *Aust Occup Ther J*. 2001;48(4):150–6. <http://dx.doi.org/10.1046/j.1440-1630.2001.00245.x>.
14. Dionne C, Turcotte F, Tennina S. Length of stay in a comprehensive rehabilitation programme for chronic low-back pain and residual disability five years after discharge. *Int J Rehabil Res*. 1994;17(1):87–94. <http://dx.doi.org/10.1097/00004356-199403000-00011>. Medline:7960333
15. De Feo S, Tramarin R, Faggiano P, et al. The inability to perform a 6 minute walking test after cardio-thoracic surgery is a marker of clinical severity and poor outcome. Data from the ISYDE-2008 Italian survey. *Int J Cardiol*. 2011;151(1):115–6. <http://dx.doi.org/10.1016/j.ijcard.2011.06.024>. Medline:21724274
16. Brennan GP, Parent EC, Cleland JA. Description of clinical outcomes and postoperative utilization of physical therapy services within 4 categories of shoulder surgery. *J Orthop Sports Phys Ther*. 2010;40(1):20–9. <http://dx.doi.org/10.2519/jospt.2010.3043>. Medline:20044703
17. Hoenig H, Hoff J, McIntyre L, et al. The self-reported functional measure: Predictive validity for health care utilization in multiple sclerosis and spinal cord injury. *Arch Phys Med Rehabil*. 2001;82(5):613–8. <http://dx.doi.org/10.1053/apmr.2001.20832>. Medline:11346837
18. Mackenzie AE, Chang AM. Predictors of quality of life following stroke. *Disabil Rehabil*. 2002;24(5):259–65. <http://dx.doi.org/10.1080/09638380110081805>. Medline:12004971
19. Huang HC, Chung KC, Lai DC, et al. The impact of timing and dose of rehabilitation delivery on functional recovery of stroke patients. *J Chin Med Assoc*. 2009;72(5):257–64. [http://dx.doi.org/10.1016/S1726-4901\(09\)70066-8](http://dx.doi.org/10.1016/S1726-4901(09)70066-8). Medline:19467949
20. Bates BE, Stineman MG. Outcome indicators for stroke: application of an algorithm treatment across the continuum of postacute rehabilitation services. *Arch Phys Med Rehabil*. 2000;81(11):1468–78. <http://dx.doi.org/10.1053/apmr.2000.17808>. Medline:11083350
21. Galski T, Bruno RL, Zorowitz R, et al. Predicting length of stay, functional outcome, and aftercare in the rehabilitation of stroke patients. The dominant role of higher-order cognition. *Stroke*.

- 1993;24(12):1794–800. <http://dx.doi.org/10.1161/01.STR.24.12.1794>. Medline:8248957
22. Schwartz I, Tsenter J, Shochina M, et al. Rehabilitation outcomes of terror victims with multiple traumas. *Arch Phys Med Rehabil*. 2007;88(4):440–8. <http://dx.doi.org/10.1016/j.apmr.2007.01.001>. Medline:17398244
23. Nott MT, Chapparo C, Baguley IJ. Agitation following traumatic brain injury: an Australian sample. *Brain Inj*. 2006;20(11):1175–82. <http://dx.doi.org/10.1080/02699050601049114>. Medline:17123934
24. Ordu Gokkaya NK, Dalyan Aras M, Oken O, et al. Fever during post-acute rehabilitation in patients with brain injury. *J Rehabil Med*. 2005;37(2):123–5. <http://dx.doi.org/10.1080/16501970410001096>. Medline:15788348
25. Buttenshaw P, Dolman J. The Roehampton approach to rehabilitation: a retrospective survey of prosthetic use in patients with primary unilateral lower-limb amputation. *Top Geriatr Rehabil*. 1992;8(1):72–8. <http://dx.doi.org/10.1097/00013614-199209000-00010>.
26. Beckerman H, Roelofsen E, Knol D, et al. The value of the Rehabilitation Activities Profile (RAP) as a quality sub-system in rehabilitation medicine. *Disabil Rehabil*. 2004;26(7):387–400. <http://dx.doi.org/10.1080/09638280410001662941>. Medline:15204475
27. Fell NT. The effectiveness of mental practice as a complement to traditional therapy in rehabilitation outcomes of patients status-post total knee arthroplasty [dissertation]. Knoxville: University of Tennessee; 2001. Available from: <http://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=2003032970&site=ehost-live>.
28. Fritz JM, Brennan GP, Leaman H. Does the evidence for spinal manipulation translate into better outcomes in routine clinical care for patients with occupational low back pain? A case-control study. *Spine J*. 2006;6(3):289–95. <http://dx.doi.org/10.1016/j.spinee.2005.11.002>. Medline:16651223

APPENDIX 1: DATA CHARTING FORM

Authors (year; country)	Health condition (no. of participants)	Study design	Outcomes related to length of stay
Bates & Stineman (2000; United States) ¹	Stroke (421 cases were included, with 37 receiving outpatient therapy services)	Cohort study	<ul style="list-style-type: none"> LOT referred to services provided across the full continuum of care. It included the number of days spent in rehabilitation, starting with initial rehabilitation contact and ending with final contact, including outpatient visits. Average LOT was longest for the most severely disabled population in the lower band (FIM–FRG ST-1, ST-2, ST-3) and shortest in the upper band group (FIM–FRG ST-8, ST-9). Overall, the patients who received outpatient therapy services had a mean of 13.1 visits.
Beckerman et al. (2004; Netherlands) ²	Stroke, amputation of the lower limb, SCI, MS, Guillain-Barre syndrome, or post-poliomyelitis syndrome (933 cases: 214 in RAP, 282 in partial RAP, and 437 in non-RAP; data analyzed for 665 in-patients and 152 outpatients)	Cohort study	<ul style="list-style-type: none"> In outpatient rehabilitation, patients with partial RAP had a LOS of 0.49 times shorter than non-RAP patients ($p < 0.001$).
Brennan et al. (2008; United States) ³	Outpatient PT patients after shoulder surgery (1,877 outpatients)	Cohort study	<ul style="list-style-type: none"> Women had worse admission pain and disability scores, worse disability discharge score, used more visits, and had longer LOS than men. Patients with RCR had significantly more visits than patients in all other categories except glenohumeral chondral repair or biceps tears. LOS was significantly greater for patients with RCR than for patients with subacromial decompressions, acromioclavicular joint, or frozen shoulder manipulation.
Brennan et al. (2010; United States) ⁴	Outpatient rehabilitation for shoulder surgery: unidirectional instability repair, RCR, RCR with a subacromial decompression procedure, and subacromial decompression (856 outpatients)	Cohort study	<ul style="list-style-type: none"> No significant difference was found between gender and LOS in all four surgical categories.
Buttenshaw & Dolman (1992; United Kingdom) ⁵	Patients with primary unilateral amputation at the transtibial or transfemoral level, resulting from peripheral vascular disease (32 patients: 20 unilateral transtibial amputation and 12 transfemoral amputation; unclear whether patients were in-patients, outpatients, or both)	Cross-sectional study	<ul style="list-style-type: none"> The average length of hospital admission, which included a 2- to 3-day assessment period, was 81 days for the total group. Patients with transfemoral amputation were discharged earlier, averaging 75.6 days compared with the 83.7 days experienced by those with transtibial amputation.
De Feo et al. (2011, Italy) ⁶	Cardiovascular disease (2,281 outpatients)	Cohort study	<ul style="list-style-type: none"> When admitted to day hospital programs, women underwent a longer rehabilitation program.
Dionne et al. (1994; Canada) ⁷	LBP of sufficient severity to justify continuous sick leave for a duration of 6 months (i.e., 180 consecutive d) after an occupationally related injury (106 outpatients)	Cohort study	<ul style="list-style-type: none"> Participants were separated into three groups according to tertiles of the distribution of LOS in the rehabilitation program (0–59 d, 60–111 d, ≥ 112 d). The only participant characteristic that showed a statistically significant relationship with LOS was the variable “did or did not experience at least 2 previous episodes of LBP requiring a sickness leave of at least 2 weeks duration,” which was associated with the second LOS tertile (60–111 d of LOS group) more than with the other LOS tertiles ($p = 0.01$). The variables of gender, age (< 40 y old or > 40 y old), education (< 9 y or > 9 y of formal education), previous surgery for LBP, radiating pain at entry, and other neurological sign at entry were not found to have a statistically significant association with the LOS tertiles (all $p > 0.05$). The study showed an association between duration of treatment within a comprehensive rehabilitation program and the long-term functional status of patients with chronic LBP. These results suggest that LOS does have an influence on the functional status of patients and that this influence is still measurable and significant 5 years after discharge from treatment.

Authors (year; country)	Health condition (no. of participants)	Study design	Outcomes related to length of stay
Fell (2001; United States) ⁸	Osteoarthritis patients, status post total knee arthroplasty (23 patients; unclear whether they were outpatients or in-patients)	Quasi-experimental study	<ul style="list-style-type: none"> The association is quadratic-like, with patients having received between 43 and 79 sessions of treatment remaining less severely disabled than the others. The effects of mental practice, when used in conjunction with traditional therapy for patients post-knee replacement surgery, on functional recovery and hospital LOS were investigated. The improvements made by the experimental group were made in significantly shorter hospital LOS than those of the controls ($p < 0.05$).
Fritz et al. (2006; United States) ⁹	Patients with LBP from outpatient physiotherapy clinics (215 outpatients)	Case-control study	<ul style="list-style-type: none"> Patients receiving manipulation therapy had shorter LOS in physical therapy (12 vs. 17 d). Non-thrust manipulation had more therapy sessions and longer LOS but difference between manipulation groups for LOS or cost were not significant.
Galski et al. (1993; United States) ¹⁰	Stroke or orthopaedic injury (86 total in-patient; 50 orthopaedic, 36 CVA. 84% of the total population received outpatient rehab)	Cohort study	<ul style="list-style-type: none"> Cognitive abilities, such as the ability for conceptualization, short-term memory, and constructional ability, significantly contributed to the variance associated with the prediction of outpatient therapy hours. Compared to the orthopaedic cohort, the CVA patients required significantly more weekly hours of outpatient therapy.
Gandhi et al. (2012; Canada) ¹¹	Stroke (86 outpatients)	Cohort study (unpublished article, grey literature)	<ul style="list-style-type: none"> A moderate correlation was found between total number of functional problems on admission and LOS ($r = 0.456$, $p < 0.001$). Total number of disciplines was moderately correlated with LOS ($r = 0.471$, $p < 0.001$). Total number of goals set for treatment was moderately correlated with LOS ($r = 0.519$, $p < 0.001$). A significant moderate correlation ($r = -0.324$, $p = -0.002$) between age and LOS. LOS was not significantly different between men and women ($p = 0.343$).
Ordu Gokkaya et al. (2005; Turkey) ¹²	Patients with TBI; injury types included traumatic and anoxic brain injuries (74 patients; unclear whether they were outpatients or in-patients)	Cohort study	<ul style="list-style-type: none"> The average LOS stay for patients with and without fever was 62.5 days and 49.8 days, respectively, and this difference was not significant. LOS stay was insignificantly a week longer in patients with both non-neurological injuries and fever than for patients without such findings. Average length of rehabilitation stay was only 2 days longer in patients with associated non-neurological injuries (i.e., fractures or organ damage) but without fever.
Grimmer & May (2001; Australia) ¹³	Health conditions not specified (360 outpatients)	Cohort study	<ul style="list-style-type: none"> Patients aged 75 years or more had significantly increased likelihood of requiring longer episodes of care than patients aged between 17 and 74. Patients judged by occupational therapists to have communication difficulties (such as speech and hearing impairment, non-English-speaking background, or cognitive impairment) were significantly more likely to have longer episodes of care than patients without such difficulties. Patients treated in a metropolitan hospital had longer episodes of care than patients treated in rural settings. There were no noteworthy non-significant results, nor were there identifiable trends.
Greater Toronto Area Rehab Network (2011; Canada) ¹⁴	MSK and neuro-stroke (143 participants from outpatient rehabilitation programs from the Greater Toronto Area Rehab Network membership as well as 1 non-member)	Cohort study (final annual report, grey literature)	<ul style="list-style-type: none"> Average LOS of specialty clinics for patients who have MSK condition was 51 days and the average LOS of specialty for patients who have neuro-stroke condition was 352 days. LOS of single services and inter-professional programs for MSK was 69 days compared with 89 days for neuro-stroke. In comparison to MSK programs, neuro-stroke programs (including specialty clinics) had a longer LOS in rehabilitation hospitals and acute teaching hospitals, but a slightly shorter one in acute community hospitals; these variances were primarily accounted for by the presence of specialty clinics with a long average LOS.

Authors (year; country)	Health condition (no. of participants)	Study design	Outcomes related to length of stay
Hoenig et al. (2001; United States) ¹⁵	MS and SCI (6,361 with SCI 1,789 with MS; outpatients)	Cohort study	<ul style="list-style-type: none"> No statistically significant correlation between self-reported Functional Measure score and number of outpatient visits.
Huang et al. (2009; Taiwan) ¹⁶	Stroke (76 from multidisciplinary rehabilitation programs, including PT and occupational therapy in the in-patient department and continuous rehabilitation therapy in the outpatient department for at least 3 mo)	Cohort study	<ul style="list-style-type: none"> Rehabilitation intervention time from onset, existence of aphasia, LOS, and having had craniotomy were negatively correlated with Barthel Index at 1 month ($p < 0.05$). Barthel Index scores at 1 month, 3 months, 6 months, and 1 year after stroke were negatively correlated with LOS ($r_s = -0.4, -0.19, -0.26$, and -0.14, respectively). Barthel Index improvement scores at the same time intervals were positively correlated with LOS with the exception of at 1 month, which showed a weak negative $r = -0.03$. The following months showed $r_s = 0.27, 0.21$, and 0.13 respectively.
Hunter et al. (2010; United States) ¹⁷	Medicare beneficiaries (60+) receiving outpatient physical therapy for a 3-year period (1,905 outpatients)	Cohort study	<ul style="list-style-type: none"> Patients with knee and shoulder conditions received the highest number of PT visits (mean 8.5 and 8.0). Lowest number of visits for thoracic (4.7), cervical (5.7) and lumbar (5.9) patients with an overall mean of 6.9 (SD 4.7).
Mackenzie & Chang (2002; China) ¹⁸	Stroke (215 patients; unclear whether they were outpatients or in-patients)	Cohort study	<ul style="list-style-type: none"> LOS was significantly and positively correlated with 3-month Sickness Impact Profile ($r = 0.48$, $p = 0.001$). Sickness Impact Profile, a generic QOL measure, consists of 136 items, 12 subscales, and two dimensions, physical and psychological. The Sickness Impact Profile has been used as a measure of QOL taking into account impairments, disabilities, and handicaps within the context of environment. Higher scores reflect greater dysfunction.
Magel et al. (2011; United States) ¹⁹	Orthopaedic: TCF and TNoCF (total: 747 outpatients, of whom 694 were classified as having TNoCF and 53 were classified as having TCF)	Cohort study	<ul style="list-style-type: none"> No significant differences were found in any outcome between men and women in either the TNoCF or TCF groups. In the TNoCF group, the average number of visits was 5.1 (SD 3.2) days and mean LOS was 26.3 (SD 28.6) days. In the TCF group, the average number of visits was 5.3 (SD 3.2) days and mean LOS was 29.0 (SD 21.3) days.
Nott et al. (2006; Australia) ²⁰	TBI (80 patients; unclear if outpatient or in-patients)	Cohort study	<ul style="list-style-type: none"> Agitated patients experienced longer LOS and longer duration of agitation was associated with longer rehab
Schwartz et al. (2007; Israel) ²¹	MT without CNS involvement, MT with TBI, and MT with SCI (144 participants; receiving in-patient and outpatient rehabilitation)	Cohort study	<ul style="list-style-type: none"> LOS of the terror patients was significantly longer than that of the non-terror patients. TBI patients' mean LOS was significantly longer than that of the non-terror patients. There was no difference in LOS between terror and non-terror patients. LOS of the SCI subgroup was significantly longer than that of the TBI subgroup ($p = 0.03$) and the MT subgroup ($p = 0.003$), for both terror and non-terror patients. No significant difference was found between LOS of the MT and TBI subgroup of terror or non-terror patients. No statistically significant correlation was found between demographic variables and LOS. There was a correlation between the occurrence of PTSD and LOS in outpatients. Patients with PTSD stayed 58 (SD 22) days longer than patients without PTSD symptoms ($p = 0.01$).

LOT = length of treatment; FRG = function-related groups; ST = stroke; SCI = spinal cord injury; MS = multiple sclerosis; RAP = Rehabilitation Activity Profile; LOS = length of stay; PT = physical therapy; RCR = rotator cuff repair; LBP = low back pain; CVA = cerebrovascular accident; TBI = traumatic brain injury; MSK = musculoskeletal; QOL = quality of life; TCF = thoracic spine pain with compression fracture; TNoCF = thoracic spine pain with no compression fracture; MT = multiple trauma; CNS = central nervous system; PTSD = posttraumatic stress disorder.

APPENDIX 2: PRELIMINARY LIST OF LENGTH OF STAY FACTORS**Patient Factors**

1. Age
2. Gender
3. Language and communication difficulties
4. Level of function and disease impact
5. Physical diagnosis and comorbidities

Institutional Factors

6. Location of rehabilitation centre
7. Institutional interdisciplinary communication program
8. Number of disciplines seen by patients
9. Rehabilitation setting

Clinician Factors

10. Choice of treatment technique
11. Total number of treatment goals