

Municipality-based physical rehabilitation after acute hip fracture surgery in Denmark

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ABSTRACT

INTRODUCTION: Patients who are surgically treated for an acute hip fracture in Denmark commence early in-hospital physical rehabilitation (PR) with more than 95% of patients referred to further PR following discharge. However, the specifics of the PR services after discharge are unknown. Thus, the aim of the present paper was to describe the specifics of PR provided to patients following discharge after hip fracture (HF) surgery in Denmark to evaluate the need for future interventions or guidelines.

METHODS: This was a national, cross-sectional questionnaire survey including 56 randomly selected municipalities out of 98. Information was gathered on PR and categorised into outpatient PR (including one-to-one and group), home-based PR, 24-hour in-patient PR units and nursing homes.

RESULTS: Sixty PR centres (97%) within 51 municipalities (91%) participated. The PR was initiated within 1-2 weeks after the municipality had received a referral from the hospital in 97% of the participating centres. The duration of PR was 8-12 weeks or 4-7 weeks in 85% of the centres, and most often comprised 1-2 training sessions per week. In all, 72% out of 56 municipalities returned a specific PR programme of which only 14% provided specific information regarding the intensity and the progression of training.

CONCLUSION: PR after hip fracture in Denmark is initiated shortly after referral, for a variable duration of time and with poorly described exercise intensity and progression. This calls for a national description and implementation of an optimised PR programme according to the best available evidence.

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TRIAL REGISTRATION: not relevant.

All patients, who are surgically treated for an acute hip fracture (HF) in Denmark, commence early in-hospital physical rehabilitation conducted as physical therapy exercises (hereafter physical rehabilitation (PR)) in order to regain a minimum of basic mobility skills, if possible [1-3]. Still, most patients are being discharged from the

acute hospital with a lower functional status than their prefracture level [4], which indicates a need for outpatient PR. In accordance herewith, more than 95% of patients are referred to further PR following discharge [5]. However, the specifics of PR services after discharge are variable and evidence of best practice remains uncertain [6, 7]. Nonetheless, a few in- or outpatient rehabilitation studies following acute hospitalisation support the effectiveness of exercise programmes that include strength training [4, 8] or cardiovascular exercise [9], and for an extended period of time [10, 11]. This underlines the importance of national surveys that examine whether the PR provided for HF patients is conducted in conformity with these results. In Denmark, there is no knowledge regarding the specifics of municipality-based PR offered to patients who are discharged from hospital following a HF. Such information is important to evaluate the need for future interventions or guidelines. Similar studies have been conducted for long-term care residents in Canada following HF surgery [12], total hip and knee arthroplasty [13, 14] and breast cancer [15].

Thus, the aim of this study was to describe the specifics of municipality-based PR services after HF surgery in Denmark.

METHODS

Study population and design

The present study is a national, cross-sectional study, conducted as a questionnaire survey among municipality-based PR centres treating patients after HF surgery.

Twenty-five major operating hospitals were identified from a national register [5]. We randomly selected 50 municipalities out of a total of 98 municipalities in Denmark, equal to two municipalities per HF-operating hospital. The selection was done by drawing lots between municipalities covered by the catchment areas of each of the 25 hospitals. In case any major municipality was missing, these were subsequently included in the sample. PR centres treating patients with HF were identified by an internet search for each municipality, and 1-3 centres in each municipality were invited to participate in the survey. A total number of 62 PR centres within 56 municipalities were eligible for the survey (**Figure 1**). The HF responsible physical therapy clinician or manager at the local PR centre was identified and re-

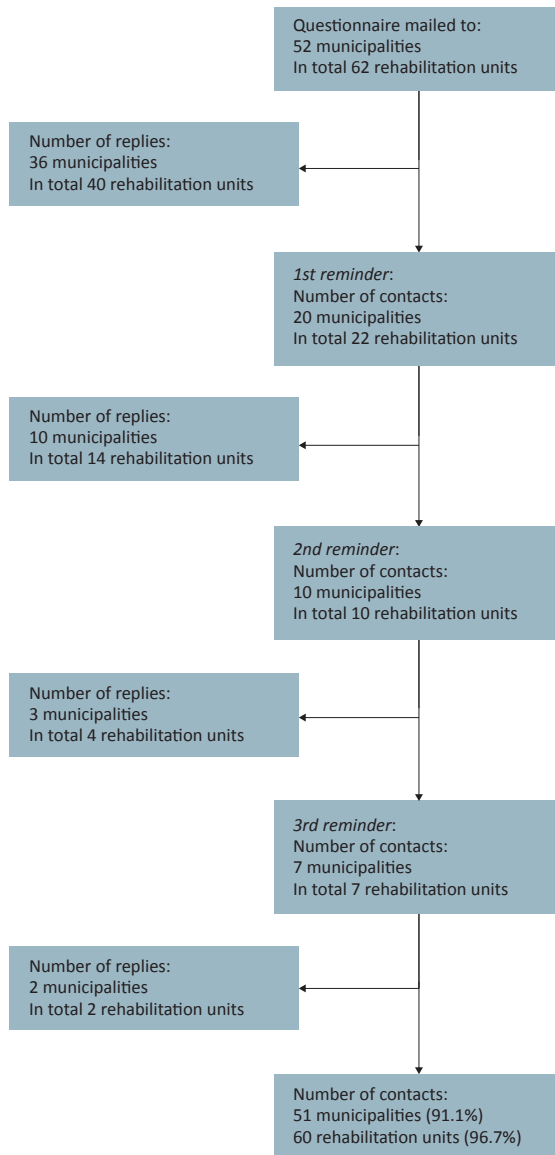
ORIGINAL ARTICLE

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FIGURE 1

Flow chart of participating municipalities and rehabilitation centres.



ceived the electronic questionnaire by e-mail. The participants were invited to complete the questionnaire and to return relevant documents or links to formal descriptions of procedures and/or specific programmes if treatment was conducted according to such in the PR centre. The survey was conducted from 7 February to 8 April 2013. Three reminders were sent. The reporting of the study adheres to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement for cross-sectional studies.

Questionnaire

An online questionnaire (Appendix A), containing ten

questions regarding the PR programme, was developed according to previous studies [14, 15]. The questionnaire covered topics including the structure of the post-discharge PR provided and whether it was conducted according to a formal description of procedures (e.g. initiation and duration of rehabilitation) and/or a specialised exercise programme (e.g. specific exercises) for patients with HF. Information was recorded in an Iprix online questionnaire form. The online template only allowed submission of the questionnaire after completion of all questions.

The questionnaire and online procedure was pilot tested in two municipality-based PR centres within two different regions. These data were not included in the final analysis.

Data analysis

Information was gathered on outpatient PR (including one-to-one and group), home-based PR, 24-hour in-patient PR units and nursing homes. Questionnaire responses were categorised according to initiation and duration of the PR (weeks), frequency (number of treatments per week), and use of formal description of procedures and/or specific programmes (yes, no).

The forwarded formal descriptions of procedures were categorised according to description of aim of PR (yes, no), treatment modalities (training of relevant activities of daily living (ADL) functions, strength training, balance exercise, range of motion exercise and other types of treatment), treatment setting (group/one-to-one exercise) and tests used (yes, no). The name of the specific tests used in the different centres was also extracted from the forwarded descriptions of procedures.

In the case of missing information or local programmes not being returned, the respondent was contacted by telephone and the programmes obtained where available. The results of the analysis are represented as absolute data and/or as percentages. Fischer's exact test was used to analyse differences between numbers of weekly sessions in different PR settings. The chi-square test was performed to provide information on differences in contents of exercise in group-exercise versus one-to-one exercise with a significance level of $p < 0.05$. The statistical analysis was conducted with SPSS 19 software.

Trial registration: not relevant.

RESULTS

Questionnaire

A total of 60 (97%) out of the 62 included PR centres, within 91% of the 56 selected municipalities, completed the survey (Figure 1).



Home-based physical rehabilitation example.

Initiation and duration of physical rehabilitation

The PR was initiated within 1-2 weeks after the municipality had received a referral from the hospital in 97% of the 60 participating centres. The duration of the PR was between 8-12 weeks in 25% of the centres or 4-7 weeks in 60% of the centres. All centres responded that the PR was extended beyond the initial period if needed.

Frequency and setting of physical rehabilitation

The frequency of PR across all types of centres was mainly 1-2 sessions per week, especially in the outpatient PR centres (72%). Therapists employed at an outpatient PR centre sometimes also administered home-based PR or PR at a nursing home unit, and therefore gave more than one response across centre categories (Table 1).

PR provided as home-based, at 24-hour inpatient PR units or nursing homes were more often based on individually adjusted terms regarding sessions per week than PR provided in outpatient centres (Table 1). The number of weekly sessions provided in the different PR settings differed when calculated as outpatient PR centre versus home-based PR ($p < 0.01$) and 24-hour inpatient PR unit versus nursing home ($p < 0.01$) (Table 1).

The form of the PR was described mainly as a combination of both group- and one-to-one exercise therapy (78%).

Formal description of procedures and/or specific exercise programmes

Totally, 29 (57%) out of the 56 municipalities responded

TABLE 1

Number of weekly sessions provided in a municipality-based rehabilitation centre reported by 60 respondents. The values are n (%).

Rehabilitation setting	Sessions per week					p-value
	1-2	3-4	all weekdays	individual	other ^c	
Outpatient rehab centre (n = 58)	42 (72)	0 (0)	1 (2)	9 (16)	6 (10)	< 0.01
Home-based PR ^a (n = 55)	21 (38)	0 (0)	1 (2)	19 (35)	14 (25)	
24-hour in-patient rehab unit (n = 52)	17 (33)	5 (9)	16 (31)	14 (27)	0 (0)	< 0.01
Nursing home ^b (n = 49)	31 (63)	0 (0)	3 (6)	12 (25)	3 (6)	

PR = physical rehabilitation.

a) Only provided if the patient was unable to come to an outpatient rehabilitation centre.

b) Rehabilitation provided in coordination with or by nursing staff after instruction.

c) Outpatient Rehab centre: 2-3 sessions per week.

TABLE 2

Type and content of exercise therapy according to formal description of procedures (n = 21)^a. The values are n (%).

	Type of treatment					p-value
	functional therapy	strength exercise	balance exercise	range of motion exercise	other	
One-to-one exercise (n = 20)	16 (80)	18 (90)	17 (85)	11 (55)	15 (75)	> 0.05
Group exercise (n = 19)	16 (84)	18 (95)	17 (90)	11 (58)	15 (79)	

a) 1 formal description gave no information on the contents of the provided treatment.

positively to having a dedicated description of procedure and/or a specific exercise programme for patients after HF surgery. In all, 72% of these 29 municipalities returned a programme; 67% had formulated a general aim for the intervention.

Structure and contents of the physical rehabilitation

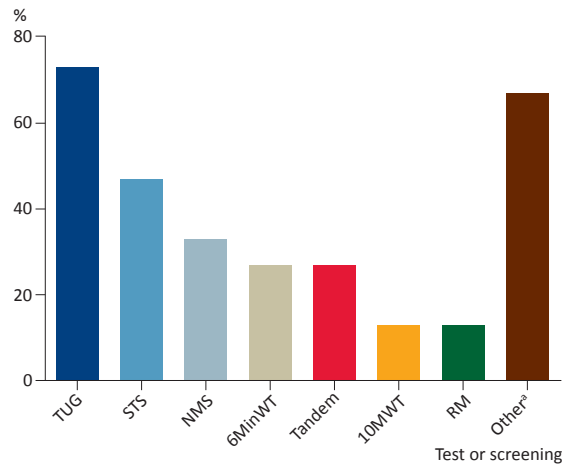
All but one (95%) of the forwarded formal descriptions described the PR conducted as a one-to-one exercise, either through the entire PR period or at the beginning of the course.

The modalities constituting the PR were exercises of relevant ADL functions, strength and balance (95%), range of motion (67%) or e.g. reduction of oedema or improvement of outdoor mobility skills (86%). Group-exercise PR was described as offered in 90% of the descriptions, aimed and conducted similarly to that reported in one-to-one PR and with no statistically significant difference ($p > 0.05$) in the distribution of primary contents between the two types of treatment (one-to-one versus group-exercise) (Table 2).

The contents of the intervention were described in general terms (e.g. regarding modalities and duration) in 76% of the programmes. Still, the majority (86%) lacked information regarding intensity and progression of the PR.

FIGURE 2

Most commonly used tests in community-based rehabilitation (n = 15).



6MinWT = 6-min. walking test; 10MWT = 10 m fast speed-walking test; NMS = New Mobility Score; RM = repetition maximum test; STS = sit-to-stand test; Tandem = tandem test of balance; TUG = timed up and go test.

a) Borg Scale, Barthel Score, Muscle Strength Testing (0-5) and Trendelenburg Test.

Test and screening in the physical rehabilitation

Test or screening of e.g. basic mobility skills or risk of falls at start of PR was described as being conducted in 76% of the forwarded descriptions, but five of these descriptions had no information that any re-test was being performed. The most frequent test in use was the Timed Up & Go test, Sit To Stand test and the New Mobility Score (Figure 2). Use of other tests were common, e.g. the Tandem test, the Six-Minute Walking Test, the 10 Meter Walking Test, Repetition Maximum, Borg scale, Barthel Score, Muscle Strength Testing (0-5) and the Trendelenburg Test.

DISCUSSION

Almost half of the participating PR centres in this study, representing more than 50% of all municipalities in Denmark, responded that they have no formal description or specific programme for PR in HF patients. Furthermore, 86% of the forwarded formal descriptions lack a specific description of the PR offered. This result suggests that the PR following HF is based on the individual therapist's estimate; a result which is similar to the results reported in a study of PR after breast cancer surgery [15]. It does, however, invite the question whether the national resources allocated to PR after HF surgery are being utilised optimally? In other words, should the contents of the PR conducted depend on the physical therapist, geography or local agreements? The questions must therefore be what is the most relevant aim of PR

for HF patients – short-term or long-term and whether all HF patients have the same need of PR, as highlighted by Beaupre et al [16]. The Cochrane review by Handoll et al is inconclusive concerning early, standard and extended interventions in regards of making exercise recommendations [6]. Studies of early PR remain few and this may reflect a fear of compromising fracture and surgery at the acute stage [17]. Nevertheless, several studies have found the early exercise interventions with weight-bearing exercises and progressive quadriceps strength training feasible and effective towards functional outcomes [4, 8, 18].

Timing of physical rehabilitation

It seems evident that the timing and contents of the PR are essential to gaining an optimal effect of the PR services provided. Therefore, the next step in targeting the municipality-based PR after HF seems to be to describe and implement best-practice evidence-based guidelines in order to adequately meet the possibly unused PR potential of the patients with a HF.

This survey explored the subjects of timing and contents in several ways. More than 30% of the 24-hour inpatient PR units responded that their patients were offered exercise only 1-2 times per week (Table 1). The effect of 1-2 sessions in a week to patients at a very low level of mobility and with an insufficient level of physical function in order to return to their home can be questioned. Thus, the aim and structure of PR in this setting needs careful consideration as do the issues of cost-effectiveness, knowledge of the value of independent living and mobility, and the patient's motivation for rehabilitation [19, 20].

Tests

This survey brings forward important knowledge on the use of tests and screening in PR for patients with HF in Denmark. We found that tests of mobility skills are commonly used, but information on re-testing procedures was limited. Use of tests within the early post-operative period as well as the extended PR of HF patients must be considered essential to ensure quality and progression in the PR.

Furthermore, the benefit is the opportunity to communicate important and standardised information between sectors about the patient's mobility skills at discharge or between different categories of PR centres. Previous studies have demonstrated the feasibility of using standardised tests of mobility skills within patients with HF both in the acute ward and in municipality-based PR [4, 18]. This may aid the recognition of patients in need of personal care or PR of specific skills after HF and optimise the allocation of resources in the field of PR and care for the patient with HF.

Strengths and limitations of the study

The task of providing PR in Denmark is heavily regulated by governmental rules and local arrangements within regions and municipalities. Consequently, our study is therefore at risk of being biased by respondents completing the survey with answers illustrating procedures performed to meet requirements rather than describing the actual treatment.

The geographical distribution of participants is regarded representative of all regions of Denmark and for small and large municipalities, similar to previous studies in PR after various surgical procedures [13-15]. Owing to the very high response rate of 91% from randomly selected municipalities, the results are considered likely to represent the current trend in municipality-based PR after HF surgery in Denmark. Still, no final conclusions can rightfully be made based on our data, but hopefully the study may stimulate a professional debate of current and future PR practice.

CONCLUSION

Although 96% of all patients with HF surgery are referred to municipality-based PR in Denmark, this survey found that only three of the 51 participating municipalities had a specific description of the PR conducted after HF surgery regarding contents, use of tests, repetitions and exercise intensity. The remaining respondents had none or only general descriptions of the PR conducted. Thus, the PR after HF in Denmark is initiated shortly after prescription, for a variable duration, and with poorly described exercise intensity and progression, mainly at the discretion of the individual physical therapist conducting the exercise. This calls for a national description and implementation of a formal PR programme reflecting the best available evidence which would be an important step toward a more optimised PR after HF.

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LITERATURE

1. Kristensen MT, Kehlet H. Most patients regain prefracture basic mobility after hip fracture surgery in a fast-track programme. *Dan Med J* 2012; 59(6):A4447.
2. Crotty M, Whitehead CH, Gray S et al. Early discharge and home rehabilitation after hip fracture achieves functional improvements: a randomized controlled trial. *Clin Rehabil* 2002;16:406-13.
3. Rapp K, Cameron ID, Becker C et al. Femoral fracture rates after discharge from the hospital to the community. *J Bone Miner Res* 2013;28:821-7.
4. Overgaard J, Kristensen MT. Feasibility of progressive strength training shortly after hip fracture surgery. *World J Orthop* 2013;4:248-58.
5. Kompetencecenter for Epidemiologi og Biostatistik Nord. Kvaliteten i

behandlingen af hoftebrud. National Auditrapport 1. juni 2011.

Copenhagen: Kompetencecenter for Epidemiologi og Biostatistik Nord, 2011.

6. Handoll HH, Sherrington C, Mak JC. Interventions for improving mobility after hip fracture surgery in adults. *Cochrane Database Syst Rev* 2011;3: CD001704.
7. Sherrington C, Tiedemann A, Cameron I. Physical exercise after hip fracture: an evidence overview. *Eur J Phys Rehabil Med* 2011;47:297-307.
8. Mitchell SL, Stott DJ, Martin BJ et al. Randomized controlled trial of quadriceps training after proximal femoral fracture. *Clin Rehabil* 2001; 15:282-90.
9. Mendelsohn ME, Overend TJ, Connelly DM et al. Improvement in aerobic fitness during rehabilitation after hip fracture. *Arch Phys Med Rehabil* 2008;89:609-17.
10. Auais MA, Eilayyan O, Mayo NE. Extended exercise rehabilitation after hip fracture improves patients' physical function: a systematic review and meta-analysis. *Phys Ther* 2012;92:1437-51.
11. Mangione KK, Craik RL, Palombaro KM et al. Home-based leg-strengthening exercise improves function 1 year after hip fracture: a randomized controlled study. *J Am Geriatr Soc* 2010;58:1911-7.
12. Buddingh S, Liang J, Allen J et al. Rehabilitation for long-term care residents following hip fracture: a survey of reported rehabilitation practices and perceived barriers to delivery of care. *J Geriatr Phys Ther* 2013;36:39-46.
13. Artz N, Dixon S, Wylde V et al. Physiotherapy provision following discharge after total hip and total knee replacement: a survey of current practice at high-volume NHS hospitals in England and Wales. *Musculoskeletal Care* 2013;11:31-8.
14. Holm B, Kehlet H. Rehabilitation after total knee arthroplasty. *Ugeskr Læger* 2009;171:691-4.
15. Poulsen LK, Hogdal N, Sorensen LV et al. Rehabilitation after breast cancer surgery. *Ugeskr Læger* 2011;173:811-4.
16. Beaupre LA, Binder EF, Cameron ID et al. Maximising functional recovery following hip fracture in frail seniors. *Best Pract Res Clin Rheumatol* 2013;27:771-88.
17. Ariza-Vega P, Jimenez-Moleon JJ, Kristensen MT. Non-weight-bearing status compromises the functional level up to 1 yr after hip fracture surgery. *Am J Phys Med Rehabil* 2014;93:641-8.
18. Kronborg L, Bandholm T, Palm H et al. Feasibility of progressive strength training implemented in the acute ward after hip fracture surgery. *PLoS One* 2014;9:e93332.
19. Johansen I, Lindbaek M, Stanghelle JK et al. Structured community-based inpatient rehabilitation of older patients is better than standard primary health care rehabilitation: an open comparative study. *Disabil Rehabil* 2012;34:2039-46.
20. Milte R, Ratcliffe J, Miller M et al. What are frail older people prepared to endure to achieve improved mobility following hip fracture? A Discrete Choice Experiment. *J Rehabil Med* 2013;45:81-6.



APPENDIX A

Municipality-based rehabilitation after hip fracture: a national questionnaire survey

1. Under which municipality is the rehabilitation administered?
2. How long is the waiting time from receiving the referral at your workplace to initiation of rehabilitation?
 1-2 weeks More than 2 weeks
3. How long is a single rehabilitation period typically?
 4-7 weeks 8-12 weeks 13-16 weeks 17-20 weeks Unlimited
4. Can the rehabilitation period be extended?
 Yes No
5. How often is treatment provided at municipality-based rehabilitation centres (per week)?
 Not relevant 1-2 sessions 3-4 sessions Daily Individually adapted (describe)
6. How often is treatment provided in patients own home (per week)?
 Not relevant 1-2 sessions 3-4 sessions Daily Individually adapted (describe)
7. How often is treatment provided in 24-hour rehabilitation units (per week)?
 Not relevant 1-2 sessions 3-4 sessions Daily Individually adapted (describe)
8. How often is treatment provided in nursing home units (per week)?
 Not relevant 1-2 sessions 3-4 sessions Daily Individually adapted (describe)
9. How is the rehabilitation provided?
 As group exercise As individual (one-to-one) physiotherapy Both options given
10. Do you have a formal description of procedures and/or a specific exercise programme for patients after hip fracture surgery?

If "Yes", please attach a link at the end of this form and supply relevant documents in an e-mail to lise.kronborg.poulsen@regionh.dk.
 Yes No