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REHABILITATION CARE AFTER HIP FRACTURE IN OLDER PATIENTS WITH COGNITIVE IMPAIRMENT: SYSTEMATIC REVIEW

T. KRAMS, C. LAFONT, T. VOISIN, A. CASTEX, M. HOULES, Y. ROLLAND

Gérontopôle of Toulouse, University of Toulouse III, CHU Purpan, Toulouse, France. Corresponding author: : Thomas Krams, 170 Avenue de Casselardit, 31 000 Toulouse France, +33 5 61 77 66 73, krams.t@chu-toulouse.fr

Abstract: *Background/Objectives:* Hip fractures (HF) are frequent in older adults. A substantial number of cognitively impaired patients are admitted to rehabilitation units, where they will receive the same care program as non-impaired patients. The aims of this literature review are to describe the results of short-, medium- and long-term rehabilitation for cognitively impaired patients. *Methods:* We conducted a systematic review of French and English articles of human studies in MEDLINE via PubMED with the key words "hip fracture" AND "rehabilitation" AND "dementia". In a second step, the references of selected articles were analyzed and a complementary search on Google Scholar was conduct for an exhaustive literature search. We extracted data on the author name, the journal, year of publication, study design, total number of patients and number of cognitively impaired patients, mean patient age, time and modality of the cognitive assessment, inclusion and exclusion criteria, rehabilitation program, and primary endpoint. *Results:* The initial literature search retrieved 147 articles. 16 reports of studies representing 2,255 patients were selected. Our study reveal that multidisciplinary rehabilitation is possible and permits functional gain that persists in the long-term. The intensity of rehabilitation can be as high as for subjects without cognitive impairment. Characteristics of dementia are prognostic factors of rehabilitation (severity of dementia, profile of dementia). Other accessible factors are malnutrition, depression, family. *Conclusion:* Concerning patients with cognitive impairment, although our data do not permit establishing recommendations for rehabilitation after HF, some important elements emerged from this review. Additional studies are needed to better define rehabilitation programs adapted to the specificities of the different types of dementia.

Key words: Dementia, cognitive impairment, hip fracture, rehabilitation.

Introduction

Hip fractures (HF) are frequent in older adults. In France, the incidence of hip fracture is estimated at about 50,000 per year, most occurring in patients over 65 years old (1,2). This incidence is expected to increase in the coming years (3). With the aging of the population, the combination of cognitive impairment and serious injury with HF is more frequent. A systematic review conducted in 2011 showed that 19.2% of patients hospitalized for HF had a diagnosis of dementia and 41.8% had cognitive impairment (4). The number of impaired patients hospitalized for HF is expected to increase during the next 20 years (5-7). HF represents the most frequent pathology in geriatric rehabilitation units and only 33% to 37% of patients return to their previous capabilities after 6 months. (8-10)

The aim of rehabilitation is to optimize the potential for recovery. However, cognitive alterations are a limiting factor in rehabilitation because patient with dementia appears to have pejorative outcome after hip fracture (11-13). A substantial number of cognitively impaired patients are admitted to rehabilitation units, where they will receive the same care program as non-impaired patients. Therefore, understanding rehabilitation for cognitively impaired patients is needed, as are specific rehabilitation programs to optimize functional gain.

The aims of this literature review are to describe the results of rehabilitation at short-, medium- and long-term after the end of the rehabilitation for cognitively impaired patients concerning functional ability, place of living and duration of hospitalization; describe the most effective rehabilitation program for patients with cognitive impairment; and identify criteria to identify patients with cognitive impairment who are eligible for rehabilitation.

Materials and methods

Literature search strategy and inclusion and exclusion criteria

We conducted a systematic review of French and English articles of human studies in MEDLINE via PubMED with the key words "hip fracture" AND "rehabilitation" AND "dementia". Articles published until December 12, 2016 were included. Inclusion criteria were as follow:

- Prospective cohort studies
- Studies randomized controlled or not
- Studies evaluated the results of a strategy of rehabilitation in patients with HF who were older than 65 years
- Studies including patients with cognitive impairment (received cognitive assessment)
- And studies comparing the results of 2 strategies of rehabilitation in such patients.
- Studies could compare the outcome of cognitively impaired and intact participant or compare outcome of two rehabilitation strategies in cognitively impaired patient.

Exclusion criteria were:

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- Case reports
- Studies that not including patient with cognitive impairment.

The Selection process was made by the first author (TK). We first reviewed the titles and abstracts of all retrieved the articles, then read the full text of potential articles. Selected studies could assess not just patients with cognitive impairment. In a second step, the references of selected articles were analyzed and a complementary search on Google Scholar was conduct for an exhaustive literature search. Finally, we contacted authors of the articles of studies of cognitively impaired patients but without the specific outcomes of interest in their article.

Data extraction

We extracted data on the author name, the journal, year of publication, study design, total number of patients and number of cognitively impaired patients, mean patient age, time and modality of the cognitive assessment, inclusion and exclusion criteria, rehabilitation program, and primary endpoint.

We evaluated the results of the rehabilitation at short, medium and long term after the rehabilitation concerning functional ability, place of living and duration of hospitalization in order describe the most effective rehabilitation program for patients with cognitive impairment; and identify criteria to identify patients with cognitive impairment who are eligible for rehabilitation.

Quality of studies

We evaluated the quality of studies by using a validated scale (Down and Black) (14). This scale has good reproducibility to assess the quality of randomized and non-randomized studies. It evaluates, on 32 levels, 5 areas (establishment of report, external validity, internal validity, bias, power).

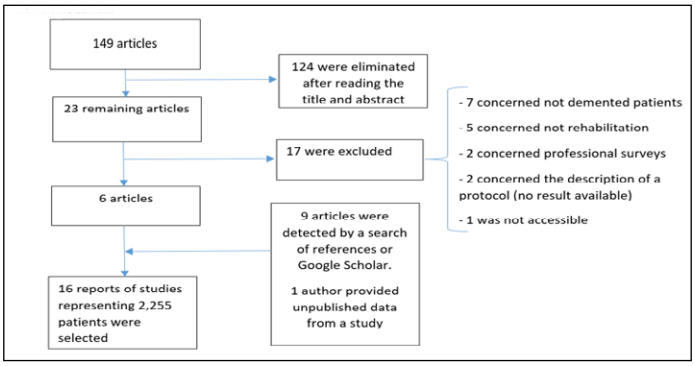
Results

Selection and characteristics of the studies (Fig. 1 and Table 1)

The initial literature search retrieved 149 articles (Fig. 1). After reading the title and abstract, 124 were eliminated. Among the 23 remaining articles, 6 were included in our review (15-21); 17 were excluded (9,11,15,21–38): 7 concerned not demented patients, 5 concerned not rehabilitation, 2 concerned professional surveys, 2 concerned the description of a protocol (no result available), 1 was not accessible. Overall, 9 articles were detected by a search of references or Google Scholar (39-47). One author provided unpublished data from a study (McGilton et al. (15)). Finally, 16 reports of studies representing 2,255 patients were selected. Number of patients vary between 11 and 319. Mean age vary between 79 and 84.5.

Among the 16 selected articles, 7 described prospective follow-ups of cohorts (17,18,20,21,41–43) studies, and 9 were of randomized studies comparing 2 strategies of rehabilitation (15,16,19,39,40,44–47). Among 7 reports of follow-ups of cohorts, 2 (Giusti (18) and Al-Ani (17)) compared the results of 2 different rehabilitation strategies (home or rehabilitation centre). Other cohort studies followed patients admitted consecutively to one or more rehabilitation services. Outcomes were then compared between patients with and without cognitive impairment.

Figure 1
Flow chart



One study (Uy et al.(44)) was interrupted prematurely due to modification of the legislation concerning nursing homes in Australia.

The characteristics and quality of all included studies are in Table 1. The studies were generally of average quality, with scores ranging from 13 to 25 out of a possible 32 points.

The population characteristics of the studies are in Table 2.

Assessment of cognitive status

Different scales were used to assess cognitive disorders (Table 1). Mini Mental Status Evaluation (MMSE) was used in 8 studies, Short Portable Mental Status Questionnaire (SPMSQ) in 6 studies the cognitive part of the functional independence measure in 1 study in association with MMSE and Mattis Dementia Rating Scale (MDRS) in one study, and the assessment method was unknown for one study. For 7 studies, cognitive evaluation was conducted in the week following the fracture.

Functional outcomes

The functional ability scales were also extremely heterogeneous (Table 1). Five studies used activities of daily living (ADL) scales (16,17,39,46,47), and 6 used the functional independence measure (FIM) or its motor part (15,20,21,41–43).

Short-term (< 3 months)

Among the 16 articles, 15 reported on functional outcomes with short-term rehabilitation. A longitudinal cohort study revealed that cognitively impaired patients generally

Table 1
Study characteristics

	Reference	N (cognitive impairment)	Type of study	Quality score (/32)	Length of follow-up (months)	Age (median [range])or (mean [SD])	Cognitive assessment scale	Time of assessment	Assessment criteria		
									Residence	Length of hospital stay	Assessment of functional outcome
Cohort studies	Goldstein et al., 1997	58 (35)	Prospective cohort	13	Approximately 1 (output)	84 [71-99]	MDRS	At inclusion (about 14 days)	% at home	-	FIM
	Heruti et al., 1999	204 (54)	Prospective cohort	16	Approximately 1 (output)	80 [65-97]	MMSE, cog FIM	24–48 hr after admission	-	Average length of hospital stay	FIM
	Lenze et al., 2004	97 (38)	Prospective cohort	14	0.5–3	81.7 [8.8]	MMSE	4 days after arrival in rehabilitation	-	-	FIM, MRFS
	Rolland et al., 2004	61 (31)	Prospective cohort	18	Approximately 2 (exit)	84.5 [70-101]	MMSE	3 days after arrival in rehabilitation	-	Average length of hospital stay	FIM, MRFS
	Giusti et al., 2007	96	Comparative prospective cohort	15	3, 6 and 12	I = 84.1 [5.4] C = 84.4 [6.9]	SPMSQ	At admission	-	-	Barthel index
	Lenze et al., 2007	97 (38)	Comparative prospective cohort	14	0.5-4	81.7 [8.8]	MMSE	At the end of the short unit	-	-	FIM
	Al Ani et al., 2010	246 (246)	Prospective cohort	16	4 and 12	85 [68-103]	SPMSQ	MD	-		Capacity to walk ADL
Randomized trials	Kennie et al., 1988	108 (51)	RCT	21	Approximately 1	I=79 [65-94] C=84 [66-94]	SPMSQ	1–7 days after fracture	% at home	Mean length of hospital stay	ADL
	Huusko et al., 2000	243 (14)	RCT	19	3 and 12 after surgery	I=80 [67-92] C=80 [66-97]	MMSE	10 days after surgery	% at home	Mean length of hospital stay	-
	Naglie et al., 2002	279 (74)	RCT	25	3 and 6 after surgery	I=83.8 [6.9] C=84.6 [7.3]	SPMSQ	MD	% at home	-	Capacity to walk
	Vidan et al., 2005	319 (78)	RCT	25	3, 6 and 12	I =81.7 [7,8] C=82.6 [7.4]	MD	MD	-	Average length of hospital stay	ADL
	Uy et al., 2008	11 (11)	RCT	18	1 and 4	I=83 C=80	SPMSQ	At admission	-	-	Barthel index walking speed
	Moseley et al., 2009	160 (54)	RCT	22	1 and 4 after surgery	I=84 [8] C=84 [7]	SPMSQ	MD	-	-	Barthel index Walking speed
	Stenvall et al., 2012	64 (64)	RCT	23	4 and 12 after surgery	I=81 [5.8] C=83.2 [6.4]	MMSE	Pre-existing dementia diagnosis	% at home	-	ADL Ability to walk
	Shyu et al., 2012	160 (51)	RCT	16	1, 3, 6, 12, 18, 24	I=81.3 [6.8] C=81.7 [7.6]	MMSE	During hospitalization	-	-	ADL Ability to walk Recurrence of fall
	McGilton et al., 2013	149 (48)	RCT	24	Until the end of hospitalization	I=82.5 [8.8] C=80.1 [6.7]	MMSE	24 hr after admission	% at home	-	Gain of motor-FIM

RCT: randomized controlled trial, I: intervention group; C: control group; ADL: activities of daily living, FIM: functional independence measure, MRFS: Montebello rehabilitation factor score, MMSE: Mini-Mental Status Evaluation, SPMSQ: short portable mental status questionnaire; MDRS: Mattis Dementia Rating Scale; MD: missing data

had less functional autonomy at the beginning and end of rehabilitation but comparable gain in absolute function value as non-cognitively impaired subjects (20,21,41,42). All work comparing 2 strategies of rehabilitation showed that patients with cognitive impairment could have functional gain improved by a specific geriatric care. Moseley et al. (45) highlighted that the median walking speed was greater for cognitively impaired patients in the intervention than control group (+ 0.2 m/s [range 0.07–0.34], p = 0.003) at 4 months.

Medium-term (3–6 months)

Six studies comparing 2 rehabilitation strategies gave functional results for the medium term (16,19,40,44,45,47). All indicated that the benefits of a specialized geriatric care were maintained in the medium term because functional ability was better for cognitively impaired patients than controls. Al-Ani et al. (17) showed that the 2 factors related to functional recovery at 4 months were former ADL (odds ratio [OR] = 2.03 [95% CI 1.59–2.58]) and having benefited from rehabilitation (OR = 4.24 [1.61–11.17]). Stenvall et al. (16) showed a higher rate of walking ability at 4 months for impaired patients than controls following a specific rehabilitation (21% vs 3%, p = 0.005). Moseley et al. (45) reported that median 16-week gain in speed was greater in the intervention than control group (+ 0.24 m/sec [range 0.05–0.44], p = 0.015))

Long-term (> 6 months)

Three studies comparing 2 strategies of rehabilitation evaluated the effectiveness of rehabilitation in the long-term (Giusti et al., Al - Ani et al., Stenvall et al.). Positive results in the short- and medium-term seemed to persist in the long-term. In the Al-Ani et al. study (17), the 2 factors associated with functional recovery at 12 months were previous ADL (OR = 2.51 [95% CI 1.80-3.50]) and specific rehabilitation care (OR= 5.53 [1.44-19.65]). Stenvall et al. (16) revealed that more patients in the rehabilitation than control group regained their previous ability (53% vs 21%, p = 0.027).

Place of living

Short-term (< 3 months)

The place of living in the short-term was evaluated in 3 studies: one cohort (21) and 2 randomized studies (26, 39). The cohort study found a non-significant increased risk of institutionalization for cognitively impaired versus non-impaired patients (25% vs 54% still living in the community after HF, p = 0.141). Two randomized studies revealed that geriatric rehabilitation increased the chances of returning home for cognitively impaired versus non-impaired patients (73% vs 54% returning home for the intervention and control groups, respectively, Mcgilton et al.(15)).

Medium-term (3-6 months)

Three randomized studies (16,19,40) evaluated the medium-term outcomes. Huusko et al. (19) reported a higher probability of living at home for patients with moderate (Mini-Mental State Examination [MMSE]= 12-17) and mild (MMSE = 17-23) dementia with than without specific rehabilitation (63% vs 17% and 91% vs 67% for moderate and mild dementia, respectively). Naglie et al. (40) showed a significant difference concerning the place of living for cognitively impaired patients between the usual-rehabilitation and the intervention group. Stenvall et al. (16) showed no difference in residence between the intervention and control group (80% vs 83% of patients with dementia in the geriatric-rehabilitation and usual-rehabilitation group, respectively). In these studies, the information concerning residence before the HF was not indicated.

Long-term (> 6 months)

Two studies (15, 19) assessed place of living at 1 year. For Huusko et al. (19), specific rehabilitation could reduce the rate of institutionalization for patients with moderate dementia (MMSE = 12–18) (62% vs 33% of patients living at home in the classic-rehabilitation and intervention group, respectively). This was not the finding for the mildly or severely impaired patients. Stenvall et al. (16) found no difference in residence for cognitively impaired patients with a program.

Length of stay in rehabilitation care

Duration of hospitalization was evaluated in 2 cohort studies and 3 randomized studies. In the cohort studies, length of stay was longer for cognitively impaired than non-impaired patients: + 2 days on average in the Goldstein et al. study (21) and 28.2 ± 13 versus 21.2 ± 9.2 days for impaired versus non-impaired patients (p < 0.001) in the Heruti et al. study (20)).

Three randomized studies showed that duration of hospitalization was shorter in the intervention than control group. In the Kennie et al. study (39), length of stay was shortened by geriatric support for patients with mild, moderate, and severe dementia (25 vs 31 days, 21 vs 61 days and 53 vs 66 days, respectively). In the Huusko et al. study(19), the length of stay was decreased with geriatric rehabilitation only for patients with MMSE 12 to 17 and 18 to 23 (47 vs 147 days, p = 0.042, and 29 vs 46 days, p = 0.002, respectively). In the Stenvall et al. study (16), although not significant, a specific geriatric rehabilitation decreased the duration of hospitalization (20 ±12 days vs 32.1 ± 35.5 days, p = 0.059).

Description of interventions

Interventions are described in Table 3. The main information provided were location, stakeholders, and intensity. No article accurately described the rehabilitation techniques used. Length of intervention is described only in two articles (Huusko et al. and Mosley et al.).

Table 2
Characteristicstudy populations

Cohort studies	References	Inclusion criteria	Exclusion criteria	Proportion of included patients reasons for exclusion
	Goldstein et al., 1997	> 65 years old, HF surgery	Post-surgical confusion, mental retardation, multiple fractures	MD
	Heruti et al., 1999	> 65 years old, HF surgery	Other acute pathologies	204/224 (91%), no justification for the exclusion
	Lenze et al., 2004	> 60 years old, admitted for rehabilitation after HF, capacity to consent		57/88 evaluated patients (64.7%) Justification of the exclusion: 20 refusal, 4 unstable patients, other: patient too impaired to sign etc.
	Rolland et al., 2004	> 70 years old, consecutively admitted for HF rehabilitation in Toulouse	No severe cardiac, neurological, respiratory pathology. Ability to walk 10 m before the fracture. Acute pathology at arrival in the rehabilitation unit	MD
	Giusti et al., 2007	> 70 years old, successively admitted to Genoa hospital, underwent surgery, osteoporotic fracture SPMSQ < 8		MD
	Lenze et al., 2007	> 60 years old, capacity to consent	Metastatic cancer	97/139 (70%) Justification for the exclusion: refusal, lost to follow-up before 2 weeks, no rehabilitation
	Al Ani et al., 2010	> 65 years old, dementia, HF, 1 of 4 hospitals University of Stockholm		246/408 evaluated patients (60.3%) No justification for the exclusion
Randomized trials	Kennie et al., 1988	> 65 years old, consultation for HF, female		108/144 evaluated patients (75%) justification for the exclusion: death, pathological fracture, waiting too long before transfer to rehabilitation unit
	Huusko et al., 2000	> 65 years old, HF, ability to walk without technical assistance before the fracture	Pathological fracture, multiple fracture, calcitonin treatment, end stage of a chronic disease	260/608 evaluated patients (42.8%) No justification for the exclusion
	Naglie et al., 2002	> 70 years old, benefited from a surgical support for HF in a Toronto Hospital	Multiple fracture, pathological fracture, life expectancy < 6 months, history of surgery on the hip, needed the help of someone to walk before the fracture	280/689 evaluated patients (40.6%) Justification for the exclusion: no bed available, multiple trauma, refusal to participate, others
	Vidan et al., 2005	> 65 years old, hospitalized for HF in a Madrid hospital	Inability to walk, ADL = 0, pathological fracture, life expectancy < 12 months	321/384 evaluated patients (83.6%) Justification for the exclusion: dependent, life expectancy < 12 months, refusal
	Uy et al., 2008	Women, living in nursing homes, north of Sydney, able to walk before HF		11/33 evaluated patients (33.3%) Justification for the exclusion: inability to walk before the fracture, could not follow instructions, refusal of consent
	Moseley et al., 2009	Consecutive admissions in rehabilitation unit after surgery for HF. Possibility to walk 4 steps with assistance. Living in community with the prospect of returning	Presence of a caregiver if needed. Exclusion if SPMSQ < 6 if absence of caregiver	160/404 (39.6%) Justification for the exclusion: SPMSQ < 6, refusal of consent, contraindications to exercise, direct return home after the surgery, inability to walk 4 steps.
	Stenvall et al., 2012	> 70 years old, consecutive admissions in surgery in Umeå (Sweden) for HF, results only for the subset of patients with dementia	Rheumatoid arthritis, severe osteoarthritis, severe renal failure, pathological fracture, confinement in bed before the fracture	199/258 eligible patients (77.1%)
No justification for the exclusion				
	Shyu et al., 2012	> 60 years old, unilateral fracture, arthroplasty or internal fixation, normal range of motion before the fracture, Barthel index > 70 before the fracture, northern Taiwan	MMSE < 10, Pathology at a terminal stage	MD
	McGilton et al., 2013	> 65 years old, living at home, transfer to rehabilitation after surgery, with or without cognitive impairment, presence of a caregiver		149/163 eligible patients (91%) Justification for the exclusion: refusal, no caregiver, inability to consent.

HF, hip fracture

Table 3
Intervention

	References	Intervention	Control
Cohort studies	Goldstein et al., 1997	-Geriatric hospital -18-bed in a rehabilitation unit -multidisciplinary (physiotherapist, occupational therapist, psychologist, dietician, occupational therapist) -Intensity: 3 hr/day -Interviews of family	
	Heruti et al., 1999	- 30-bed in geriatric center -multidisciplinary (physiotherapist, occupational therapist, psychologist, social worker, geriatrician) -weekly multi-disciplinary meeting -rehabilitation 6 hr/week, 6/7 days	
	Lenze et al., 2004	MD	
	Rolland et al., 2004	-Geriatric rehabilitation centre - multidisciplinary (physiotherapy, occupational therapy, dietician, geriatrician) -weekly multi-disciplinary meeting -2 daily sessions of rehabilitation of 1 hr -5 days/week	
	Giusti et al., 2007	- Home -Programs determined by the physiotherapist	-Rehabilitation centre
	Lenze et al., 2007	-Rehabilitation centre -3 hr/day - multi-disciplinary rehabilitation (physiotherapy or occupational therapy)	-Nursing care center -up to 2 daily sessions -less contact with physicians
	Al Ani et al., 2010	-Rehabilitation centre -Physiotherapy and occupational therapy daily	-residence -Physical therapy several times a week
Randomized trials	Kennie et al., 1988	-Peripheral hospital -multidisciplinary (physiotherapy, occupational therapy, speech-language pathologist, dietician) -visit a geriatrician 3 times/week -multidisciplinary meeting once per week -easy access to orthopedic opinion	-Department of orthopedics -access to physical therapy and occupational therapy
	Huusko et al., 2000	-Central hospital -geriatric rehabilitation centre -3 weeks -2 sessions/day -Motivation meeting, activities by nurse outside the rehabilitation sessions -multidisciplinary (occupational therapist, physiotherapist, psychologist, social worker, geriatrician, general practitioner, neurologist) -weekly meeting -visits home before and after the release -family interview	-local hospital
	Naglie et al., 2002	-Specific hospital service - multidisciplinary (physiotherapist, occupational therapist, social worker) -post-operative early -research and prevention of geriatric complications -early mobilization -stimulation for activities of daily living -training of personnel for elderly care -supervision by a geriatrician -weekly meeting -rehabilitation twice/day, 5/7 days	-Specific hospital service -More limited access to physical therapist and occupational therapist -No staff trained -Possibility of geriatric consultation only on request of the orthopedics team
	Vidan et al., 2005	-Orthopedics units -Daily evaluation by a geriatrician, -multidisciplinary (social worker, psychologist, geriatrician, orthopedic) -Evaluation 72 hr after the operation to set the rehabilitation program -weekly multi-disciplinary meeting.	-Orthopedics units -Evaluation by nurse and surgeon - Specialized geriatric opinion only at the request of the orthopaedic team

Table 3 (continued)
Intervention

References	Intervention	Control
Uy et al., 2008	-Rehabilitation unit - Multidisciplinary rehabilitation program using the principle of accelerated rehabilitation (undescribed)	- Nursing home
Moseley et al., 2009	-Rehabilitation unit -16 weeks -2 daily sessions -1 hr/day -Exercises in charge, relieved support exercises, walking exercises, rang of motion and force exercise -Gradual increase of the intensity and the number of repetitions -gradual reduction of the relief of the body weight -Training of different types of walking. Training of chair lift -continuing rehabilitation at home -Visits at home after hospitalization	- Rehabilitation unit -4 weeks. 30 min/day -discharge exercise (bed or standing) -walk between parallel lines -Gradual increase in number of repetitions -No home visits after hospitalization
Stenvall et al., 2012	- Geriatric unit -Detection and early treatment of complications (standardized geriatric assessment) -early mobilization -multidisciplinary (physiotherapist, occupational therapist, dietician, geriatrist) -12 patients for one physiotherapist and occupational therapist -education of nurse -1.07 nurse/patient -Evaluation 4 months after hospitalization.	-Orthopedics unit -nurse 1.01/patient -No education of nurse -14 patients for one physiotherapist -54 patients for one occupational therapist
Shyu et al., 2012	-Orthopedic unit and living place -Geriatric assessment -Development of a rehabilitation program -rehabilitation program at home -begin 1 day after surgery and until 3 months after the hospitalization -During hospitalization: 4 visits to geriatric nurse, 2 visits to a physical therapist and a physical medical visit -After the hospitalization: 8 visits of a nurse and 3 visits of physiotherapist during the first 3 months -adaptation of the living place	-Orthopedic unit and residence -During hospitalization: 3 visits of physiotherapist -after hospitalization: no visit
McGilton et al., 2013	-Rehabilitation unit -Rehabilitation care -delirium prevention program -Education of health professionals -Education of family caregivers -Use of REAP model (Relate well, modification of the Environment, emphasis on Abilities-focused care, concept of Personhood)	-Rehabilitation unit -Initial assessment -Physiotherapy or occupational therapy 1 hr/day -Improvement of range of motion and force -No cognitive evaluation

Factors of the rehabilitation in prognosis

We found several criteria that could influence the results of the rehabilitation after HF in cognitively impaired patients.

1) Severity of dementia: Rolland et al. (23) showed that patients with low FIM at the end of the rehabilitation had the most severe dementia. However, Huusko et al. (17) found that geriatric care was beneficial for patients with moderate dementia (MMSE = 12–18) but not severe dementia (MMSE < 11). In Naglie et al. (21), rehabilitation was more beneficial for patients with mild to moderate than severe dementia. In the Kennie et al. study (20), geriatric care benefitted patients with moderate or severe dementia than beginning dementia.

2) Cognitive profile: Goldstein et al. (19) evaluated the association between the success of rehabilitation and the cognitive altered domain. The preservation of memory (p=0.026), conceptualization (p = 0.003) and initiation/perseverence (p = 0.003) on the Mattis Dementia Rating Scale was associated with improved FIM score at the end of rehabilitation. The preservation of initiation/perseverence and conceptualization was associated with improved FIM during rehabilitation (p = 0.047 and p = 0.031, respectively).

3) Previous autonomy: Autonomy before the HF is an important prognostic factor of functional outcome (11,15,19,23). For example, for Al-Ani et al. (15), the preservation of ADL after rehabilitation in cognitively impaired patients was associated with ADL before the HF (OR= 2.03 [95% CI 1.59-2.58], p < 0.001, at 4 months and 2.51 [1.80-3.50], p < 0.001 at 12 months).

4) Other prognostic factors: previous functional ability (15,23), nutritional status, and the presence of a family (11) and depression (23).

Discussion

Few data exist on rehabilitation after HF (48-50). Although HF is frequent among older patients with cognitive impairment,

we have few data to optimize the rehabilitation of these patients. Our systematic review included 16 studies of variable quality on this topic. Therefore, the level of evidence presented is limited and conclusions must be formulated carefully.

We found substantial heterogeneity concerning rehabilitation programs investigated as well as the assessment of cognitive impairment, functional ability, the time of the evaluation or the study design, so interpretation of results is complicated. The development of recommendations for the rehabilitation of cognitively impaired patients based on only these data seems impossible.

Concerning the rehabilitation strategy, this review does not allow for defining recommendations and these finding are consistent with the recent Cochrane review (51).

Nevertheless, the following items resulted in positive outcomes in the studies examined:

- Location of program: a geriatric rehabilitation service. Only one study (Giusti) evaluated the effectiveness of the rehabilitation in the patient's place of living and found positive results.

- Participants: multidisciplinary team of physician geriatrician and therapist, physical therapist, occupational therapist, dietician, neuropsychologist, nurse. Several studies (15, 16, 40) proposed specific training of the medical team in support of older patients. A weekly meeting was proposed in all studies.

- Intensity: Different programs were offered with different levels of intensity, which is broadly comparable to what is generally offered to older patients without cognitive impairment. The intensity is from 2 to 3 hr/day divided into 2 sessions, 5 to 6 days/week.

- Duration: the duration of the rehabilitation is poorly described and actually depends on each situation.

Some factors appear to be able to be associated with the results of the rehabilitation in patients: the severity of dementia (19, 39, 40, 42), type of deficit (21), previous autonomy (17, 21, 31, 42), existence of a depressive syndrome (43), nutritional status and presence of family members (15).

The most appropriate tool for evaluating the results of rehabilitation cannot be determined. The 2 most commonly used scales are the ADL and the FIM. Evaluating effectiveness of rehabilitation of patients with cognitive impairment seems more logical with functional than analytical scales such as range of motion or muscle strength.

The originality of this review is the evaluation of predictive factors of success or failure of rehabilitation. We highlight some factors of success of the rehabilitation after HF.

This study also has limitations. First, given the heterogeneity of the data, very disparate results were found with 9 randomized studies and 7 cohort studies. In addition, data concerning cognitively impaired patients were generally post-hoc analyses of randomized trials. Second, the search and selection of articles involved only one database (MEDLINE), so certain articles may have been missed. Finally, the generalization of the results requires that studies include patients representative of the target population, and the low rate of recruitment of our studies (Table 2) complicated the generalization of the results.

Conclusions

Concerning patients with cognitive impairment, although our data do not permit establishing recommendations for rehabilitation after HF, some important elements emerged from this review. Multidisciplinary rehabilitation is possible and permits functional gain that persists in the long-term. Rehabilitation in a non-geriatric unit produces worse outcomes than that in a geriatric rehabilitation unit. The intensity of rehabilitation can be as high as for subjects without cognitive impairment. Characteristics of dementia are prognostic factors of rehabilitation (severity of dementia, profile of dementia). Other accessible factors (malnutrition, depression, family) should be considered to evaluate the prognosis of rehabilitation. Most studies are secondary analysis and concern heterogeneous population which complicated the generalization of the results. Additional studies are needed to better described (type and intensity of exercise, location, category and number of participant, length, objective) rehabilitation programs adapted to the specificities of the different types of dementia.

Competing interest: All authors have nothing to disclose

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