

ORIGINAL ARTICLE

Early physiotherapy care in the frail hospitalised elders: Prospective cohort study

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Abstract. *Background and aim:* Frailty is an age-related condition, of increasing concern given ageing of world population. The aim of this work was the evaluation of early physiotherapy in frail patients admitted at Fiorenzuola d'Arda hospital. *Methods:* A prospective cohort study, with two recruitment intervals, was conducted. Patients older than 65 years, with a Barthel Index score of 70 or below, frailty and indication for physiotherapy were recruited. Barthel Index delta, length of hospitalisation, physiotherapy activation time were assessed as main outcome; sub-analyses were conducted according to the cause of hospitalisation. *Results:* 63 subjects were included in the study, and 5 were later excluded due to complications. Statistical analysis showed significance regarding hospitalisation length ($p=0.03$), early activation of physiotherapy ($p=0.002$), delta Barthel ($p=0.03$). Sub-analyses showed significance for respiratory patients ($p=0.04$). *Conclusions:* Early physiotherapy is effective to address frailty and improve self-efficacy, by enhancing elders' residual resources. Future studies should integrate field test to deepen motor outcome. (www.actabiomedica.it)

Key words: frailty, elder, early physiotherapy, inpatient cares

Introduction

Frailty is an aging-related condition, characterised by the decline of multiple physiological systems' functions, and by an increased vulnerability to stress factors (1). It affects 4-60% of the elderly (≥ 65 years), and is associated with a significantly higher risk of adverse health effects, such as fractures, hospitalization mortality (1-5). These data suggest that the rapid increase of world's mean population age will also lead to an increase in the incidence of frailty, and its associated healthcare costs, whose sustainability will increasingly become a challenge for national health systems (6-9).

From a clinical point of view typical onset of frailty regards gait disturbance, lower levels of physical activity, general weakness (10); a progressive functional decline is observed, with even a greater degree

of dependence by caregivers (11). In this perspective, frailty induces worse outcome in hospital setting; in fact, while it is true that it negatively affects functional status of elder people, impairment is even greater for hospitalized patients (12). Previous studies have found that elder hospitalized patients have a faster functional decline compared to other treatment regimen (13-14).

Frailty management strategy comprises an integrated and complex approach and, despite the actual lack of high quality studies (15), it seems that an intervention based on nutritional intake correction, drugs optimization and physical activity could be effective.

Therapeutic exercise represents a central tool to address frailty consequences on muscles, cardiorespiratory fitness and balance: several guidelines recommend the inclusion of tailored exercise in a comprehensive care path for frail elders (16-17). A wide range of

exercise modalities have been proposed in literature: aerobic training, strength/flexibility exercises, high intensity interval training, static/dynamic neuromuscular control, walking (18). Nevertheless, evidence shows a gap for frail hospitalized patients, even in terms of treatment strategies as for the timing to start a tailored inpatient tacking charge.

In this context, in April 2023, a new clinical-procedure was adopted at Azienda USL of Piacenza (AUSL); the main novelty was the activation, for frail hospitalised patients, of an early physiotherapy approach, driven by a structured evaluation.

The aim of this study was to conduct a quantitative investigation, in order to describe the effects of early physiotherapy on a sample of elder/not autonomous patients, in terms of achieving greater independence in daily life activities, reduction of hospitalization length, and the number of falls during the stay, following the application of AUSL organizational/procedural changes.

Materials and methods

A prospective cohort study was conducted at Internal Medicine and Long-term Care Unit of Fiorenzuola d'Arda Hospital.

The study lasted seven months, and included two distinct patient recruitment/data collection periods: a pre-procedural period of 6 weeks (March-April 2023), and a post-procedural period of the same length (June-July 2023); these periods were interrupted by an internal training course dedicated to care staff, conducted by two research team members; the course (organised in six hours of theoretical and practical contents) was aimed at explaining the new introduced procedure, and improving knowledge about rehabilitation treatment/patients' mobilization and safety during hospitalization.

A convenience sampling strategy was adopted, with following inclusion criteria:

- Frailty, determined by internist specialist through a multidimensional evaluation, in which numerous risk factors were taken into

account (poly-pharmacotherapy, malnutrition, sarcopenia, low physical activity, depression, dementia)

- Hospitalization
- Age ≥ 65 years;
- Dependence in ADLs, evidenced by a score < 70 on Barthel Index (BI) (19).
- Physiotherapist's indication for early rehabilitative care

Patients belonging to the same unit who met one or more of the following characteristics were excluded from recruitment:

- Age < 65 years;
- Presence of psychiatric pathologies that could compromise patient's cooperation
- Presence of pathological fractures
- Recent traumas and/or surgical interventions to the musculoskeletal system, or conditions of clinical instability requiring an appropriate Individual Rehabilitation Project (PRI) drafted by a physiatrist
- History of bedrest or severe hypokinetic syndrome prior to hospitalization with chronic characteristics.

Within the includable population, sub-analyses were planned concerning the medical diagnoses of the treated patients: respiratory failure, heart failure/cardio-logic disease, conditions of multi-morbidity. Patients were followed from the date of rehabilitative care until discharge. During the follow-up, patients who, due to newly arisen unsuitability, interrupted physiotherapy, were excluded. Patients who died during hospitalization were also excluded.

Evaluation and intervention

For both cohorts, the following general information were collected: age, sex, admission diagnosis; day of hospital entry, day of physiotherapy cares start, day of discharge, discharge facility, number of treatments administered, number of falls during hospitalization, brief summary of exercise administered. The primary

outcome of the study was patient self-efficacy, through the administration of the Barthel Index by a team researcher (see inclusion criteria). Other outcome of interest were the days needed to start physiotherapy, hospitalization length and falls. Subpopulations of patients were:

- Respiratory patients: admission diagnoses of respiratory failure, COPD exacerbations, bronchitis, and pneumonia;
- Cardiac patients: admission diagnoses of heart disease, myocardial infarction, and heart failure;
- Multi-morbid patients: diagnoses of hypokinetic syndromes, grounding syndromes, infections, oncological patients, and organic decay

Physiotherapy evaluation was based on anamnestic documentation and clinical assessment of passive/active range of motion of all districts, strength, muscle lengths, trunk control, balance and gait.

For patient with indication to physiotherapy treatment, 60 minutes-daily sessions (from the day of taking charge to the end of hospitalization) were planned with the same physiotherapist (a research team member); treatment modalities regarded articular mobility, lower limb reinforcement, assisted transfers, trunk control exercises, functional skills (sit to stand, static/dynamic trunk control), gait training with/without appropriate orthoses/walker, aerobic training.

Statistics

Statistical analyses were performed using SPSS 20.0 package. A first descriptive statistic, with general information about gender/age/admission and discharge information was developed. The study of outcome was instead carried out by identifying the change in average scores, preliminarily studying normality through Kolmogorov-Smirnov test, and then performing parametric and non-parametric tests to verify statistical significance. T-student test was employed for variables with a normal distribution, while Mann Whitney test for data with non-normal distribution; cut-off for statistical significance was set for $p < 0.05$.

Results

The overall includible population consisted of 63 patients, with 29 recruited during pre-procedural time and 34 during the second time sequence (post-procedural cohort). Among the recruited patients in the pre-procedural cohort, only one did not complete the follow-up due to the onset of a stroke during hospitalization, and was therefore excluded from study analyses. In the post-procedural cohort three patients were excluded due to the suspension of treatment by clinical complications, and one patient due to death. The population that completed the follow-up, and was so included in the final analysis, was composed by 58 patients; the mean duration of physiotherapy intervention was 9 days for both recruiting periods.

In Table 1 general characteristics of the cohorts were presented: both groups had similar mean age at study time, and also for gender the proportion

Table 1. General characteristics of the sample.

Variable	Pre procedural cohort (n=28)	Post-procedural cohort (n=30)
Mean age	87 (SD±6,1) years	86 (SD±7,28) years
Gender (women)	N= 15	N=13
Gender (men)	N=13	N=17
Admission diagnosis	N=10	N=8
Heart disease	N=8	N=10
Respiratory acute event	N=10	N=12
Multiple disease		
Admission from	N=0	N=0
Home	N=19	N=25
Emergency Hospital	N=1	N=0
Department	N=8	N=5
Surgical Hospital		
Department		
Health care		
Residence		
Discharge to	N=15	N=20
Home	N=5	N=4
Different Hospital	N=8	N=6
department		
Health care		
residence (RSA)		

N: number; SD: standard deviation.

men/women had little differences (more women in pre-procedural cohort). Sub groups were also numerically similar, with a total of 18 patients with heart disease, 18 with respiratory events, 22 with multiple disease. As for admission, the most part (76%) of the sample came from Piacenza Ausl Emergency Department (44 total cases), a lower proportion (13 cases- 22%) by health care territorial residences, and only one patient arrived to the study department from Ausl surgical division (2%).

A further interesting data was that of discharge structure: both in pre-procedural cohort that in post-procedural one the was a high proportion of patients that returned in home setting (35- 60% of the sample), while 9 patients were transferred in another Hospital Department (16% of the sample); finally, 14 patients were discharged/returned in Health Care Residence (24%). Proportionally, a high percentage of home returns were found in post-procedural cohort (respectively 66% versus 53% of the group).

Outcome variations

In Table 2 outcome variation in the two distinct moment of the study was reported, with relative

statistical analysis. The first two variables had non-normal distribution in pre-procedural cohort, while delta BI was normally distributed, both as general population value as for sub-groups; so, Mann Whitney test was used for physiotherapy activation and hospitalisation length, while Student's T-Test was employed for delta BI.

The analysis of the interval between patient's admission and physiotherapy start revealed that, with the new procedure, the time required was halved, passing from a median value of 5 to 4 days, with a consistent lowering for mean value (from 9.5 to 5 days) and a lower variability in post-procedural cohort (both standard deviation that interquartile range were halved); this difference proved to be statistically significant ($p=0.002$). Similarly, patients in post-procedural cohort experienced a short recovery period, with a median value of 2 days lower in (from 15 days to 13); even in this case mean value had a consistent improvement, 6.6 days lower (from 20.4 to 13.8 days), and data were closer to mean. Again, this proved to be statistically significant ($p=0.03$).

Falls, instead, were less sensible to intervention, since there were no episodes in the two groups.

Table 2. Outcome of interest variations and statistics.

Outcome of interest	Pre-procedural cohort (mean $\pm$ SD; Median; IRQ)			Post-procedural cohort (mean $\pm$ SD; Median; IRQ)			Statistics
Day to start physiotherapy	9.5 ($\pm$ 9.7) d	5 d	5	5.03 ($\pm$ 5.7) d	4 d	2.5	$p=0.002$ (MWT)
Days of hospitalization	20.7($\pm$ 11.52) d	15 d	14	13.8 ($\pm$ 5.08) d	13 d	6	$p=0.03$ (MWT)
Falls	0			0			N/A
Delta BI (BI discharge-BI admission)	17.1 ($\pm$ 15.4) pt	16 pt	27	22.6 ($\pm$ 10) pt	24 pt	15	$p=0.03$ (TT)
Delta BI-respiratory patients (n=18)	13.8 ($\pm$ 12.5) pt	11 pt	21	25 ($\pm$ 9.4) pt	26 pt	18	$p=0.04$ (TT)
Delta BI-cardiologic patients (n=18)	18.5($\pm$ 13.8) pt	20.5 pt	19.5	24.5 ($\pm$ 15.04) pt	27 pt	23.5	$p=0.45$ (TT)
Delta BI-polipathologic patients (n=22)	13.3 ($\pm$ 12.1)pt	11.5 pt	22	19.3($\pm$ 8.7) pt	17.5 pt	11	$p=0.17$ (TT)

SD: standard deviation; IRQ: Inter-quartile range; Pt: points; d: days; N/A: not applicable; MWT: Mann-Whitney test; TT: student's T test; BI: Barthel Index.

Barthel Index (BI) delta

Barthel Index delta (defined as discharge value-admission one) was the main outcome we identified to verify the effect of early physiotherapy approach. The general trend described a better variation in post-procedural cohort, even as mean value that for subgroups analysis, thus suggesting the efficacy of early intervention. Particularly, its delta in post-procedural cohort (mean value) was higher of 5 points than in pre-procedural group (from 17.1 to 22.6), with reaching of statistical significance at T-Test ($p=0.03$). Interesting data, then, were retrieved by subgroups analysis: respiratory post-procedural patients had the better spread in delta BI, with an 11.2 points of difference, and this observation proved to be significant ($p=0.04$). Cardiologic patients, instead, showed a higher BI delta of 6 points, but in this case improvement was not significant ($p=0.45$). In multi pathological patients, finally, post-procedural cohort had a 6 points mean gain with early physiotherapy, but even here significance threshold was not achieved ($p=0.17$).

Discussion

The present study was conducted in conformity to STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) (20) statement. Some methodological strength prevented the presence of bias: enrolment of similar cohort, data collection by the same researcher, objective outcome measures (day of hospitalization, time to start physiotherapy) obtained by medical records.

Some weakness, however, emerged: the use of BI allowed to describe, despite the causes of admission, the overall gain in term of self-efficacy for both groups. Since physiotherapy acts primarily on motor system, maybe integrating a field test (i.e. short physical performance battery- SPPB or 6-minute walking test, 6MWT) would have given more attention to the motor profile of included patients. Another limitation was the number of subjects recruited: the presence of more patients in both cohorts could have allowed to reach significance in that items for which only a little gap was detected (delta BI for cardiologic and

multi-pathological patients). Again, the loss of 5 patients at follow up was a limit in our analysis, as it created an imbalance between examined cohorts.

Coming to our results, from outcome analyses, it can be affirmed that the new procedure for early rehabilitative care has already shown initial evidence of effectiveness in terms of autonomy, hospital stay days, and earliness of approach.

The reduction in waiting days between entry and the start of physiotherapy, that occurred for post-procedural cohort, suggests that the procedure contributed to streamlining the cooperation between professional figures, and how the ward staff's responsibility for patient care also for mobilization aspects; this finding was in line with similar works on post-surgical elder patients (21-22).

Regarding patients' self-efficacy results, data reveal an improvement in average delta BI scores in the post-procedural cohort, which proved to be statistically significant. This finding reinforces the idea that starting early physiotherapy means having a better outcome in everyday life, in line with previous experiences in literature (23).

Also for sub-population analysis BI delta was favourable to early intervention; particularly, we noted a more pronounced improvement, who reached significance, for respiratory patients, while for other population it was near threshold (multi-pathological patients) or not significant (cardiologic patients). This was in line with literature, which suggests implementation of rehabilitation programs in heart failure old patients (24): our mean value, in fact, was better in post-procedural cohort, but significance threshold was not reached. Maybe, with a largest study sample, statistical analysis would have further confirmed this finding. The benefit of early physiotherapy treatment for elder hospitalised respiratory patients was completely in accordance with previous studies on COPD (chronic obstructive pulmonary disease) population (25). The effectiveness of an exercise intervention in poly-pathological elders was in line with Martinez-Velilla et al. results (26).

The general trend to better self-efficacy outcome in post-procedural cohort was further confirmed by the reduction of hospitalization; the coherence of data suggests that an early intervention for frail patients

induces a reduction in care-related costs. The reduction of hospitalization period was further in accordance with other similar experiences by Liu et al. (27-28).

Conclusion

Results by this study highlight the need to study early tacking charge for frail elders, both in relation to patients' autonomy and for hospitalization and relative costs. Furthermore, in line with studies emerged in the literature, early physiotherapy proves to be one of the possible solutions to adopt for managing functional decline associated with hospitalization. Frailty, as an impacting geriatric condition with a progressively increasing incidence, remains a phenomenon that requires the attention of healthcare system; therefore, this study aims to be a stimulus and an encouragement for further insights, to optimize the recovery of these patients, and the prevention of further clinical complications.

Ethic approval: The study was approved by AVEN Ethics Committee on 04/04/2023- no. 2023/0038949 Prot. Fisioprecoce. Piacenza Ausl approval was given on 14/04/2023, prot. 2023/0000174.

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