Aging Clinical and Experimental Research
https://doi.org/10.1007/s40520-020-01488-1

ORIGINAL ARTICLE

Three-year National report from the Gruppo Italiano di Ortogeriatria (GIOG) in the management of hip-fractured patients

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Received: 30 October 2019 / Accepted: 17 January 2020

Abstract

Background Hip fractures (HF) are a major issue worldwide. We aimed at evaluating the practices in delivering care to patients with HF among several Italian Orthogeriatric centers.

Methods The study took place from February 2016 to July 2018. Seven performance indicators (pre-surgical cognitive assessment, surgery performed ≤ 48 h from fracture, removal of urinary catheter/absence of delirium/start of physiotherapy on the first post-operative day, prescription of bone protection at discharge, and discharge toward rehabilitation) were collected.

Results The 14 participating hospitals totally recruited 3.017 patients. Patients were old (median age 86 years; Inter Quartile Range [IQR] 80–90), mostly females (77%). Nearly 55% of them were already impaired in mobility and about 10% were nursing home residents. Median time-to-surgery was 41 h (IQR 23–62). Models of care greatly varied among centers, only 49.3% of patients being co-managed by geriatricians and orthopedics. There was high variability across centers in four indicators ("pre-surgical cognitive assessment", "bone protection prescription", "use of urinary catheter" and "start of physiotherapy"), moderate in two indicators ("surgery performed ≤ 48 h from fracture" and "discharge toward rehabilitation" and low in one ("absence of delirium on day following surgery"). Comparison with international studies suggests very different ways of providing care to HF Italian patients.

Conclusions The study results suggest high inter-center variability in the key-performance indicators, and different approaches in providing care to our HF patients in comparison to other countries. A National debate on the topic is required in Italy to harmonize practices of orthogeriatric care.

Keywords Hip fracture · Older · Orthogeriatric · Multicenter · Surgical

Introduction

Hip fractures still represent a devastating event for patients and a major issue for the National Health Systems worldwide [1]. The yearly number of hip fractures estimated worldwide is 1.6 million, with over 610.000 cases in Europe and more than 123.000 in Italy [2]. Nearly one-third of all patients die within 1 year after experiencing hip fracture and an estimated proportion of 50%, among survivors, does not regain the pre-fracture functional status [3–5]. The impact in terms of direct (i.e., acute in-hospital treatment, post-operative complications, rehabilitation and use of health services) and indirect (i.e., caregivers and family burden) costs is substantial [6–8].

There is growing evidence that a multidisciplinary and coordinated approach to patients with hip fracture is associated with significant advantages in terms of clinical outcomes, and it currently represents the best model of care for these individuals [9, 10]. Typically, a multidisciplinary and

Electronic supplementary material The online version of this article (https://doi.org/10.1007/s40520-020-01488-1) contains supplementary material, which is available to authorized users.

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Published online: 05 February 2020

coordinated approach integrates surgical, medical, nursing and rehabilitative care, as well as social workers and specialists in bone health assessment and management [11, 12].

Recently, a network of Orthogeriatric and Orthopedic Units, named Gruppo Italiano di OrtoGeriatria (GIOG), was created in Italy to collect data of older patients admitted to hospital wards after hip fracture. Three Scientific Associations of Geriatrics [i.e., the Società Italiana di Gerontologia e Geriatria (SIGG), the Associazione Italiana Psicogeriatria (AIP) and the Società Italiana Geriatria Ospedale e Territorio (SIGOT)] supported this network, with the purpose of disseminating the orthogeriatric approach and improve quality of care in this field. As a first initiative, the GIOG published in 2014 a joint position statement on the management of patients with hip fracture [11]. Then, it developed an electronic database to collect clinical information on patients with hip fracture and monitor the practices of care within each center. The National Hip Fracture Database (NHFD), that currently covers more than 170 hospitals across England, Wales and Northern Ireland, was the inspiring model of the GIOG [13].

The aims of our study are to describe the results of the 3-year GIOG activity and to evaluate the current practices in delivering care to patients with hip fracture, comparing them with international databases and highlighting similarities and differences among centers of our network.

Materials and methods

This is a multicenter observational study to monitor the practice of care and various key-performance indicators among Italian acute hospital wards delivering care to older patients with hip fracture. Clinicians potentially interested in participating in this study were notified of the initiative through emails by the scientific Associations endorsing the project or were individually contacted by the members of the GIOG Steering Committee.

This was conceived as a 3-year duration study paving the way for subsequent multicenter National studies along the line of the NHFD. The study started on February 1st, 2016 and ended on July 31st, 2018. It received formal authorization by the Ethics Committee of the Federico II University, Naples, Italy (no. protocol 169/15), which was followed by the approval of the local institutional review boards of participating centers.

Dataset form

The construction of the GIOG 1.0 database followed these steps: first, we revised the NHFD Minimum Common Dataset (MCD) and selected the variables, which we considered to be easy or possible to achieve in our country. Variables, such as the AMTS score, which is used in the MCD to assess cognition, was replaced with the Short Portable Status Mental Questionnaire [14]. Second, we developed the data collection form (see Supplementary Table 1). We recorded data on age, gender, residence, mobility status and use of bone protection medications before fracture, the score of the American Society of Anesthesiologists (ASA) Classification [15], time between admission and surgery, type of fracture and type anesthesia. Then, we included other variables based on their potential relevance on clinical outcomes, such as the presence of delirium and urinary catheter, the use of protein supplementation and the start of physiotherapy on the first post-operative day. At discharge, we recorded data on the number of blood transfusions provided during the whole length of stay, the presence of skin lesions, the setting of discharge and the prescription of bone protection medications. We also collected data on the length of hospital stay and in-hospital mortality.

Not all variables of the database were mandatory. Clinicians were allowed to collect patients' data on a voluntary basis, i.e., the participating centers were not forced to recruit systematically all the patients admitted to hospital wards during the study period. We adopted this policy to facilitate the participation of centers and lay the ground for a subsequent initiative (GIOG 2.0) aimed at promoting the orthogeriatric culture on a large scale.

Key-performance indicators and outcomes

Seven key-performance indicators and outcomes were measured in this study: assessment of pre-surgical cognitive status (measured with the SPMSQ [14]), surgery performed within 48 h from fracture, absence of urinary catheter on day following surgery, absence of delirium on day following surgery, start of physiotherapy session on day following surgery, prescription of bone protection drugs at discharge, and discharge toward a rehabilitation unit.

Data analysis

First, characteristics of the patients and treatment were described: continuous data by median and first and third (I–III) quartiles (which represent the values including the central 50% of the observations), while categorical data by percentages of subjects falling in each category.

The seven key-performance indicators were then calculated, overall and by center, as the percentage of patients with the key-performance indicator over the total number of patients for whom the information was available in the database. Minimum, maximum and standard deviation across centers were calculated. For each indicator, we plotted the values by center with their 95% confidence interval (CI).

Results

The clinical characteristics of the patients and the other data collected during the study period are reported in Table 1.

Variables collected in the pre-operative phase

Fourteen hospitals participated in the study, totally recruiting 3.017 patients. The median patients' age was 86 [IQR 80–90] years and about 7% of patients were 95 years or older. Females comprised 77% of the whole population. Almost all patients lived at home before fracture (92%), whereas the others were resident in nursing home. With regard to the pre-fracture health status, more than half of patients was somehow impaired in mobility and about a fourth of them required one or two aids to walk. Moreover, less than 10% took any kind of bone protection therapy (9.7%).

The pre-surgical multidimensional assessment included both the SPSMQ [14] and the ASA score [15]. Two thousand two hundred six (73.1%) patients received an evaluation of cognitive status with the SPSMQ [14], 50% of whom had no cognitive impairment, 393 (17.8%) mild, 436 (19.8%) moderate, and 273 (12.4%) severe cognitive impairment. With regard to ASA score [15], nearly three quarters of patients were ranked as III–IV classes while the remaining as I–II classes.

Variables collected in the peri-operative phase

The mean time from fracture to surgery was 41 h (IQR 23–62), with an average of 65% of patients who underwent surgery within 48 h from fracture. Most patients received a regional anesthesia (76%), while general anesthesia was used in about one fifth of patients. Types of fracture were almost balanced between intracapsular (48.7%) and intertrochanteric or sub-trochanteric (47.3%) and the majority of them were managed with intramedullary nail (50%), followed by hemi-arthroplasty (24%), total hip replacement (15%), sliding hip screw (4%) and osteosynthesis with cannulated screw (4%).

On the first post-operative day, delirium occurred in about a fourth of all patients, protein supplementation was given only to a minority (3.9%) and less than 80% of patients had still placed a urinary catheter. Furthermore, nearly 12% of patients started the physiotherapy.

Variables collected at discharge

At discharge, less than half of patients had received two or more blood transfusions, 4.0% developed skin lesions during hospital admission, and about 70% had prescribed a bone protection therapy, including anti-fracture medications and calcium and/or vitamin D. About three quarters of patients were discharged toward a rehabilitation unit, while 10% toward a nursing home. Twelve percent of patients returned home. Median length of hospital stay was 9 days (IQR 7–14), whereas the time between surgery and discharge was 7 days (IQR 5–11). There were 45 (1.5%) in-hospital deaths.

Models of collaboration between geriatricians and orthopedics

Models of collaboration between geriatricians and orthopedics greatly differed among centers. Less than a half of patients ($n = 1464$, 49.3%) were co-managed by geriatrician and orthopedic during the whole hospitalization, whereas 908 (30.6%) were assessed by a geriatrician only in the pre-operative phase and 305 (10.3%) in the only post-operative phase. A geriatrician was not involved in the management of 291 (9.8%) patients.

Key-performance indicators: comparison among centers

The Fig. 1 shows the value of key-performance indicators, with the corresponding 95% CI, for each participating center. For each indicator, the mean and median values of the centers are also shown. Overall, important variability exists across centers regarding all the key-performance indicators. Variability is especially high with regard to the assessment of pre-surgical cognitive status (which was scored as 100% in Centers 2 and 12, while 0% in Centers 5 and 11), and in the prescription of bone protection drugs at discharge (which was reported as 99% in Centers 12 and 13, while 3% in Center 5). High variability among Centers was also found regarding the indicator "No urinary catheter on day following surgery" (which ranged from a minimum of 0% to a maximum of 74%), and the indicator "Started physiotherapy on day following surgery" (which ranged from 0 to 67%). Moderate variability was found regarding the indicator "Surgery performed within 48 h" from fracture (which ranged from 25 to 93%), and the indicator "Discharge toward a rehabilitation unit" (which ranged from 34 to 95%), whereas low variability was found with regard to the indicator "No delirium on day following surgery" (which ranged from 60 to 88%).

Discussion

We here summarized the data of a 3-year National report from the GIOG, providing evidence of the current state of the art in Italy on the management of hip-fractured patients from an orthogeriatric perspective. This study is based on

Table 1 Characteristics of patients enrolled in the GIOG 1.0 study

Patient variables	Total ($N=3017$)		
	Median (IQR)[a]	*N*	%
Demographics and pre-fracture health status			
Age (years)	86 (80–90)		
Age class			
65–74		227	7.5
75–84		1117	37.1
85–94		1464	48.5
> =95		209	6.9
Gender			
Female		2323	77.0
Male		694	23.0
Residence			
Unknown		12	
Home		2752	91.6
Nursing home		253	8.4
Mobility			
Unknown		63	
Able to walk autonomously outdoor without aid		1312	44.4
Able to walk outdoor with one aid		476	16.1
Able to walk outdoor with two aids or walker		251	8.5
Able to walk indoor, but unable to go outdoor without help		835	28.3
Unable to walk		80	2.7
Bone protection			
Unknown		15	
No bone protection medication		2578	85.9
Anti-fracture medications		132	4.4
Calcium and/or vitamin D		292	9.7
Multidimensional assessment			
SPMSQ[b] score			
Unknown		811	
0–2		1104	50.0
3–4		393	17.8
5–7		436	19.8
8–10		273	12.4
ASA[c] score			
Unknown		274	
I–II		699	25.5
III–IV		2039	74.3
V		5	0.2
Variables collected in the peri-operative time			
Type of fracture			
Intracapsular		1470	48.7
Inter-trochanteric		1167	38.7
Sub-trochanteric		258	8.6
Other		122	4.0
Type of anesthesia			
Missing		1	
General		610	20.2
Regional		2312	76.7
Other		94	3.1

Table 1 (continued)

Patient variables	Total ($N=3017$)		
	Median (IQR)[a]	*N*	%
Time between admission and surgery (hours)	41 (23–62)		
Patients undergoing surgical intervention within 48 h from fracture		1912	64.7
Type of surgery			
Intramedullary nail		1506	49.9
Hemi-arthroplasty		731	24.2
Total hip replacement		465	15.4
Sliding hip screws		128	4.3
Cannulated screw		126	4.2
Variables collected on the first post-operative day			
Delirium		735	24.4
Protein supplementation		119	3.9
Urinary catheter placed		2385	79.1
Started physiotherapy session		375	12.4
Variables collected at discharge			
Blood transfusions (no)			
0		1180	39.1
1		447	14.8
2 or more		1390	46.1
Skin lesions			
None		2833	94.0
Already on admission		60	2.0
Developed during length of stay		122	4.0
Bone protection			
Unknown		103	
No bone protection medication		874	30.0
Anti-fracture medications		905	31.1
Calcium and/or vitamin D		1135	38.9
Destination at discharge			
Unknown		49	
Home		358	12.1
Nursing home		311	10.5
Intensive rehabilitation		965	32.5
Extensive rehabilitation		1251	42.1
Other acute hospital ward		83	2.8
Time between surgery and discharge (days)	7 (5–11)		
Length of stay (days)	9 (7–14)		
In-hospital death		45	1.5

[a]IQR indicates inter quartile range

[b]SPMSQ indicates short portable mental status questionnaire. ref. [14]

[c]ASA indicates American society of anesthesiologists score. ref. [15]

the largest database that is currently available in our country, thus extending knowledge in this field. It also represents a basis for comparison of key-performance indicators among our network's centers and with other international data.

We observed substantial agreement of several findings of our study, including median age, predominant gender, pre-fracture functional status and type of hip fracture with those of other international databases and registries (e.g. Spain, Scotland and New Zealand [16–18]). However, other findings including the pre-fracture residence and the prevalence of cognitive dysfunction were clearly different from other studies. Almost all patients (91%) of our study lived at home before hip fracture, compare to a lower proportion in studies from other countries [18–20]. We also found a higher rate of pre-fracture cognitive dysfunction if compared to other databases [13, 16], likely as the result of different screening

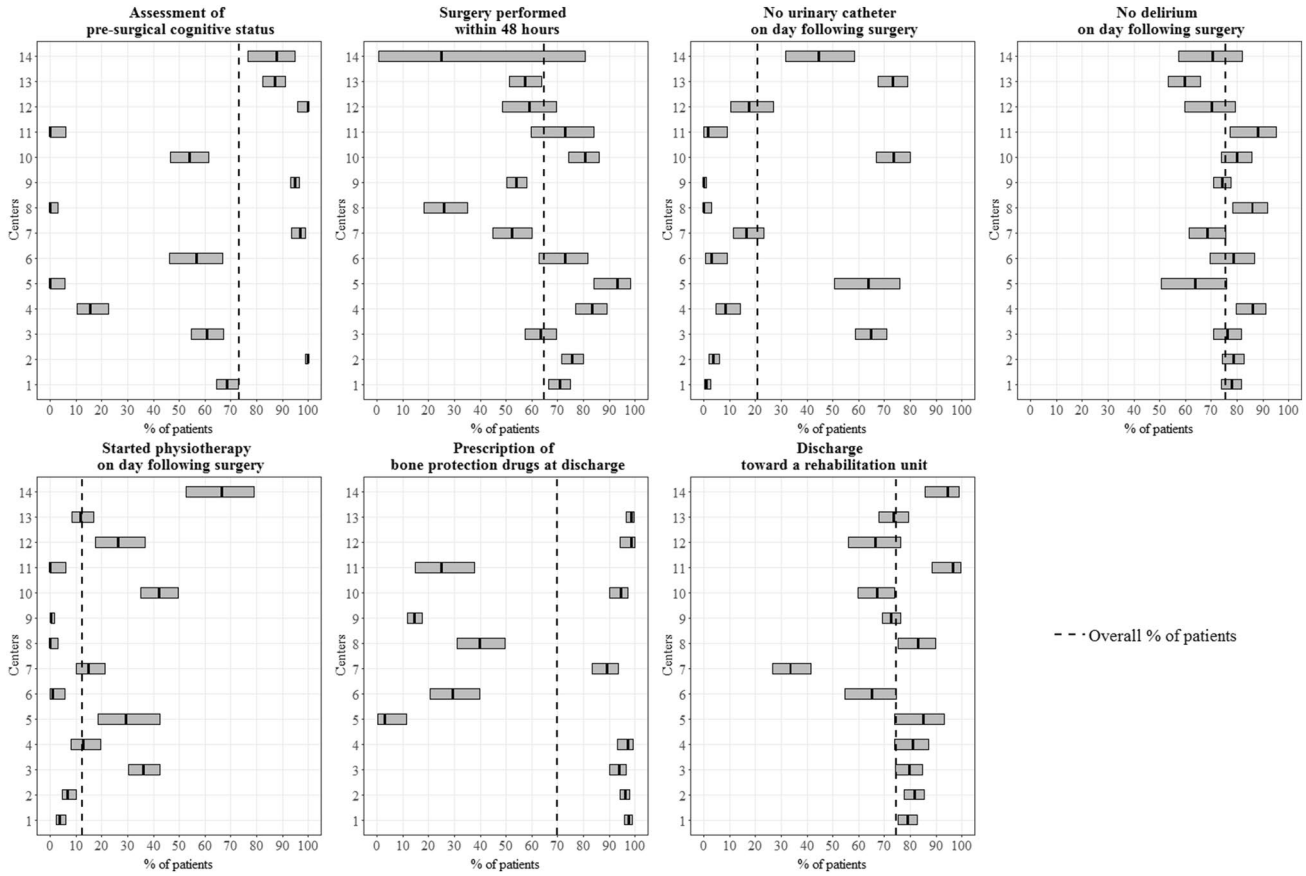

Fig. 1 Key-performance indicators among centers in the GIOG study. Each panel summarize one of the seven key-performance indicators analyzed in the GIOG cohort of older patients with hip fracture (2016–2018) in all centers. For each center (vertical axis), the black line within the horizontal grey boxes shows the percentage of patients with the indicator fulfilled, while the edges of the box represent its 95% confidence intervals. The vertical dashed line represents the percentage of patients with the key-performance indicator fulfilled over the total number of patients in the database

tools and cut-off scores used to assess cognitive impairment in different nations [13, 14, 16, 21].

Other differences were seen regarding the pre-operative and operative practices. In our study, a large majority of surgeries was performed under regional anesthesia and about half of all hip fractures were stabilized using intramedullary nail. Regional anesthesia is used more rarely in Ireland, Australia, Scotland, and Norway [17, 18, 21, 22], whereas the proportion of use of intramedullary nail in our study are similar to Spain and Germany [16, 23], but different to England, Scotland and Ireland [13, 17, 21]. These disparities are more likely depending on the local practices of both anesthesiologists and surgeons across countries, rather than by the nature of the fractures or by the patient's characteristics. Future studies are warranted to thoroughly investigate these issues. Timing of surgery is another important issue to be considered: indeed, surgical delay is strongly associated with negative outcomes in terms of mortality and complications, especially if the patients are already disabled before fracture [5, 24]. About 65% of our population underwent surgical intervention within 48 h, less than what usually occurs in most countries, in which surgery is generally performed within 24 or 36 h [13, 19, 20, 23]. A possible explanation may be the absence of dedicated surgical theatres in the majority of Italian hospitals, which may contribute increasing competition for the room availability among surgeons and diverting hip fracture after other surgeries. Furthermore, the orthogeriatric culture is not so consolidated in Italy as in other countries where the systematic analysis and performance benchmark among hospitals have significantly contribute to improve the clinical practice [13, 17–19, 21, 22].

Data regarding the variables collected in the post-operative phase also deserve comments. Delirium was found in 24% of all patients on the first post-operative day, indirectly suggesting a relevant underreporting, especially for the hypoactive and mixed subtypes of delirium [25, 26]. In fact, previous studies have shown that 35–55% of patients usually developed delirium after hip fracture surgery [25, 26]. This finding is likely due to the lack of systematic use of delirium screening tools in some centers [27].

Just over 12% of patients started physiotherapy on the first day after surgery. Despite comparison with international databases is problematic, given that they usually collect different data (i.e., the proportion of patients mobilized—and not treated by physical therapist—on the first post-operative day) [13, 16–18, 21, 28], it is, however, likely that our data reflect inconsistency in the way physiotherapy is delivered to hip fracture patients among Italian hospitals.

The use of protein supplementation and the placement of urinary catheter were also assessed on the first post-operative day in our study. This represents an element of absolute novelty, given that previous databases and registries have never assessed such data on a benchmarking perspective. Protein supplementation was found to be given only to a minority of patients, despite its evident beneficial after a hip fracture [29]. Future studies will clarify whether the low use of protein supplementation in our patients was related to lack of knowledge among clinicians on supplementation effects or to other reasons. Urinary catheter was placed in about eight out of ten patients, although studies suggest that its prolonged use increases the risk of urinary tract infections and makes acute urinary retention more frequent [30, 31]. Targeted initiatives could be useful to promote early removal of the urinary catheter after surgery.

Some other variables related to the period of hospitalization are in line with those from international studies, such as the proportion of developed skin lesions (about 5%) [16–18], the median number of red blood cell transfusion [28, 32, 33] and the in-hospital mortality rates [16–18, 21, 23].

Finally, prescription of bone protection at discharge and discharge to rehabilitation facilities were overall higher in our studies than in previous from other countries. In the GIOG study, 70% of patients were prescribed bone protection medications at discharge, while lower percentages were reported in Denmark, England, Ireland, Spain, Australia, New Zealand, Holland and Germany [13, 16, 18, 20, 21, 23, 34]. Rehabilitation was the favorite discharge destination among our patients (74.6%); in other countries, instead, less than 50% of patients is discharged to rehabilitation units [13, 16, 17, 20, 21, 23]. Both organizational aspects (e.g., the timing to start physiotherapy during hospitalization as well as the accessibility to external rehabilitation facilities) and cultural aspects, such as the family support, may play some role in explaining these differences.

Almost all key-performance indicators have shown a noticeable level of variability within the centers of our network. The variability in the proportion of patients who underwent cognitive assessment at admission and in the proportion of patients diagnosed with delirium on the first post-operative day indirectly supports the idea that cognitive and delirium assessment are not perceived as mandatory by the Italian clinicians in Orthogeriatric Units. In England, the National Health System incentivizes with a Best-Practice Tariff the hospitals in which patients undergo routine cognitive and delirium assessment, using the Abbreviated Mental Test [13] and the 4AT [35]. The high variability in the placement of urinary catheter and in the prescription of bone protection medications at discharge also reflects cultural shortcomings among clinicians of our network. Again, the variability in the percentage of patients who started physiotherapy on the first post-operative day and of those who were discharged to a rehabilitation facility are likely to be due to differences in the organization of rehabilitative services in our country. For example, it can be argued that some units are not used to discharge the patients with moderate or severe dementia towards rehabilitation facilities, since dementia is wrongly held an exclusion criterion to functional recovery [34, 35]. The elevated variability that we found among our centers in the proportion of patients who underwent surgical intervention within 48 h, deserves mention too. Early surgery after hip fracture has been incentivized in England since 2010 partially thanks to the implementation of the Best Practice Tariff (BTP) provided by the National Health system. United Kingdom was also pioneer in providing benchmark between rates of early surgery, through systematic analysis of the National Hip Fracture Database (NHFD). This policy (i.e., BPT and NHFD analysis) progressively lead to a fell in the proportion of delayed surgery, with significant benefits for the patients and improvement in the hospital's quality of care [13].

This is the largest multicenter study which has been carried out in Italy on this topic. Its multicenter nature and the presence of a dataset form shaped in the likeness of the NHFD make our data comparable with international registries and databases worldwide. Importantly, the GIOG 1.0 database may thus serve as a basis for further comparisons of orthogeriatric practice among countries.

This report has several limitations. First, the participation in our study was on a voluntary basis and on initiative of the center's physicians, who were also responsible for the data collection. This suggests that participating centers were probably much more interested in the research and might have reported more favorable care performances than others. Therefore, our study likely suffers from selection bias. Second, patient recruitment was not systematic, which could cause another selection bias. Third, the geographical distribution of the participating centers was not uniform across our country. Therefore, the results of this study cannot be considered fully representative of the Italian National context. However, the participating centers were located in large-size hospitals of the Northern and Central Italy, thus offering an insightful look of the orthogeriatric context in our country. Future study (GIOG 2.0) will hopefully involve an even broader spectrum of orthogeriatric centers, including many from the Southern Italy.

In conclusion, the considerable heterogeneity in the clinical practices among the centers participating at GIOG 1.0 suggests the urgency to develop a debate on the topic and improve knowledge among physicians working in this field. Only through these steps, orthogeriatric practices may be aligned with the international standards. This starting point lays the foundations for further initiatives (GIOG 2.0), which will deepen these issues, promoting and spreading the orthogeriatric culture on a larger scale. We hope that the GIOG study may represent the first brick in a pathway of improvement of Italian orthogeriatric care, including the recognition of the importance of speeding up the time for patients' surgery.

Author contributions GB contributed to the study conception and design. Material preparation, data collection and analysis were performed by ET, AA and MGV. The first draft of the manuscript was written by MCF, IC, ET, AA and GB. All authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Funding No Author has to disclose any conflict of interest that could have direct or potential influence or impart bias on the work.

Compliance with ethical standards

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

Ethical approval As mentioned in the Methods section, this study received formal authorization by the Ethics Committee of the Federico II University, Naples, Italy (No. protocol 169/15).

Statement of human and animal rights All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The study was approved by the Ethics Committee of the Federico II University of Naples (No. protocol 169/15).

Informed consent Informed consent was obtained from all individual participants included in the study.

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