

# Detection of Health Conditions in Elderly Patients with a Hip Fracture. Importance of Collaboration between Orthopedic and Geriatric Specialists

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**Purpose.** To assess the benefits of a Geriatric Consultant Team (GCT) to detect health conditions in elderly patients hospitalized for a hip fracture.

**Materials and methods.** This was a prospective controlled study that compared two groups: patients under the care of a GCT and those not under the care of a GCT.

**Results.** A total of 449 patients were studied; mean age 83 years; 80% women. The GCT detected more incidents in clinical records (5.4 compared to 3.3), and more previous geriatric syndromes (2 compared to 0.4). During hospitalization the GCT detected a higher rate of complications (2.1 compared to 0.4) and more geriatric syndromes (3.6 compared to 0.5). Significant differences were seen in the following conditions: anemia, malnutrition, constipation, delirium, osteoporosis, bedsores, dementia, sensory deficits and incontinence. Some of the data collected suggested that there might have been non-detected health conditions in the control group.

**Conclusions.** The GCT reviewed patients daily, which resulted in a more complete assessment and a reduction in the probability of under-diagnosing significant clinical conditions. More effective patient care is achieved when Geriatric and Orthopedic Specialists work together.

## Detección de problemas en pacientes geriátricos con fractura de cadera. Importancia de la colaboración entre traumatólogo y geriatra

**Objetivo.** Evaluar el beneficio que proporciona un Equipo Consultor Geriátrico (ECG) a los pacientes geriátricos que ingresan con fractura de cadera en cuanto a la detección de problemas clínicos.

**Material y método.** Estudio prospectivo y controlado que compara dos grupos: los pacientes manejados por el ECG y los que no conoció dicho equipo.

**Resultados.** Fueron estudiados 449 pacientes, con una edad media de 83 años y el 80% mujeres. El ECG detectó más antecedentes personales (5,4 frente a 3,3) y más síndromes geriátricos previos (2 frente 0,4). A lo largo del ingreso el ECG detectó más complicaciones (3,8 frente a 0,4), más nuevos diagnósticos (2,1 frente a 0,4) y más síndromes geriátricos (3,6 frente a 0,5). Las diferencias resultaron significativas en los siguientes problemas: anemia, desnutrición, estreñimiento, *delirium*, osteoporosis, úlceras por presión, demencia, déficit sensoriales e incontinencia. Algunos de los datos recogidos nos sugieren que pudo haber diagnósticos no detectados en el grupo control.

**Conclusiones.** La revisión diaria por parte del ECG de los pacientes ofrece una evaluación más completa y reduce la probabilidad de infradiagnóstico de problemas clínicos importantes. La colaboración entre traumatólogo y geriatra da como resultado un manejo del paciente más efectivo.

**Key words:** hip fracture, geriatric care, elderly.

**Palabras clave:** fractura de cadera, asistencia geriátrica, ancianos.

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Women have a 30% risk of suffering an osteoporotic fracture during their lifetimes. The highest incidence rate of hip fractures is after the age of 74<sup>1</sup>. This type of fracture is the most severe complication of osteoporosis and its frequency has increased due to population aging. The incidence rate of hip fractures doubles each decade of age from

the sixth on, and one third of women over 80 years of age suffer this injury<sup>2</sup>.

The correct treatment during the acute phase of hip fracture influences the patient's subsequent evolution and, also, absorbs a large part of health funds<sup>3,4</sup>. The consequence of a hip fracture in a healthy elderly person can be loss of mobility. In fact, 50% cannot walk independently again after a hip fracture. But elderly people may also lose their capacity to continue living at home, since 20% to 40% require formal care at home or in old-age-institutions and many others depend on informal care-givers. Complications are many and mortality can reach 30% a year. Furthermore, this type of fracture is more frequent in fragile elderly people, who are dependent and have a history of medical problems; therefore, we believe that the geriatrician can improve evolution in these patients. From the moment an elderly person sustains a hip fracture, diverse complications arise. For example, cognitive impairment, non-surgical diseases and hostile social conditions where these were already precarious. In elderly patients a multiplicity of diseases is very usual. Campbell, in a prospective study carried out on patients with hip fracture, found that one third of them had dementia and almost another third had suffered a stroke or had some neurological disease, one fourth had heart disease, one in six had respiratory disease and more than one in ten had cancer<sup>5</sup>. Thomas and Stevens found that 82% of the patients with hip fracture had significant medical conditions that further complicated their injury<sup>6</sup>. It is not surprising that rehabilitation is slow in many of these fragile elderly people, it has earned them the name of 'bed-blockers', since they 'block' the admission of patients booked for elective orthopedic surgery.

The concept of cooperation between orthopedic surgeons and geriatricians is not new, in fact there are papers on the subject that go back to the seventies<sup>7,8</sup>. However, in the last few years this cooperation has begun during the acute phase<sup>4,9-19</sup>.

Although studies have been carried out in different Spanish hospitals assessing the results of orthogeriatric intervention during the acute phase and they show good results<sup>4,15-20</sup>, the care-giving process itself has not been thoroughly assessed, therefore details are not clear as to how the consultant geriatric team may improve the evolution of geriatric patients with this condition. One of the usual clinical interventions of geriatricians in these cases is to perform a geriatric assessment of the elderly person, thus achieving better rates of problem detection, better development of a care and treatment plan, and probably, due to this, the evolution of these patients is better than under conventional management.

This study had a double aim. In the first place to determine the type of medical problems that elderly people admitted with a hip fracture usually develop. In the second

place to study the benefits these patients could achieve if they were treated jointly by an orthopedic surgeon and a geriatrician, as far as problem detection and other factors related to quality of treatment are concerned.

## MATERIALS AND METHODS

### Study environment

The Consultant Geriatric Team (CGT), whose activities are analyzed in this study, work in a third-level university general hospital located in Madrid. Their mode of action has been previously described<sup>20,21</sup>. At the moment the study was performed they were the referral center for a town of 560.000 people, with an aging index of 14%. The Orthopedic Surgery Department had 170 hospital beds. When this study started the Geriatric Service and the Orthopedic Surgery Service had been working together for 3 years. This study was approved by the Hospital Research Committee.

### Patients

The patients studied were all those admitted to the Orthopedic Surgery Service of the hospital that were 64 years of age or over and had a diagnosis of hip fracture, probably of osteoporotic origin, between 1st October 1997 and 30th September 1998. A hip fracture was considered to be of probable osteoporotic origin when it was caused by a fall from ground level. All fractures considered pathological or caused by trauma of greater intensity (traffic accidents, falls from a height) by the emergency physician were excluded as were all patients that died before entering the study. The sample was taken consecutively, and included all patients that came to the Emergency Service either from their homes or from other institutions. In this study the active arm included only those patients who were admitted with a proximal femur fracture that received geriatric care from and were followed up by the CGT, whereas the control group comprised all those patients with the same fracture that received conventional treatment or were not known to the CGT.

### Methods

The patients and their clinical records were assessed during the first 72 hours from admission and during the 72 hours prior to discharge. The observers were two geriatricians not working with the CGT at the moment of the study. The following variables were registered: personal and hospital stay details, clinical data registered in the clinical record as well as personal medical history and drug history prior to admission, assessment of surgical risk (by means of the classification of the *American Society of Anesthesiology*

[ASA]<sup>22</sup>), type of fracture and surgery, medical treatment received, complications and geriatric problems detected during hospitalization and any new diagnoses. As to clinical variables, only those in the clinical history were registered, the observers did not interpret data nor did they carry out a search for diagnoses. Information on functional status was collected by use of the Barthel index<sup>23</sup>; on the cognitive status by means of a Spanish version of the Short Portable Mental Status Questionnaire (SPMSQ) (Pfeiffer's test)<sup>24</sup>, and data on social status was collected using the modified Gijón Socio-family Scale<sup>25</sup>.

### Characteristics of the geriatric intervention

The CGT at the time of the study was a team of 2 physicians and 2 nurses. This team receives consultations on elderly patients admitted to other hospital services. One type of consultation would be a request for geriatric clinical followup during the hospitalization period. This followup includes a daily visit by the geriatrician, who enjoys with direct access to information on medical treatment and clinical decisions on the patient. The goal is to detect and treat acute and chronic diseases and in-hospital complications, achieve preoperative stability, maintain function and selfcare, encourage the use of in-hospital rehabilitation, prevent iatrogenesis and carry out early planning of discharge with the best level of care according to the patient's situation<sup>26</sup>.

In this study a group of patients with geriatric clinical followup, the active arm, was compared with patients admitted with hip fracture that were not referred to the CGT team<sup>20,27</sup>.

### Statistical analysis

To compare the variables between the active arm and the control group a chi square analysis was used for qualitative variables and Student's t test for quantitative variables. A multiple logistic regression analysis was used that progressively incorporated the variables associated with the bivariate analysis step by step. Independent variables were those that indicated a more effective hospital evolution (a shorter hospital stay, or more than 8 diagnoses) or a better functional prognosis (having undergone surgery and walking independently on discharge). For this analysis the median was used to assess the variable corresponding to the number of diagnoses (more or less than 8) and the duration of hospital stay (more or less than 16 days). The data was analyzed using the SPSS/PC 4.0 program.

## RESULTS

During the 12 months the study lasted, 449 patients were admitted to the hospital with an osteoporotic fracture

of the proximal third of the femur. Mean hospital stay was 16.9 days (standard deviation [SD] 8). Geriatric followup was requested for 202 patients (45%), this is the active arm of this study. The control group was made up of 200 patients, for whom the CGT was not consulted. In the case of the remaining patients (47) the CGT was consulted with reference to certain isolated issues, but no follow up was carried out and, therefore, they were not included in the comparative analysis. The total number of patients included in the study developed an average of 2.1 complications during admission and had an average of 1.3 new conditions diagnosed. In Table 1 there is a detail of the percentages of conditions found in each of these patients in the active group. On admission there are already some differences between the patients in the active group (those who consulted the CGT) and the control group (Table 2). Patients in the active group are older, include a greater percentage of men, have greater previous functional impairment in activities of daily living, a higher rate of cognitive impairment, more diseases and previous medication and had a higher incidence of surgical risk. Furthermore, they have a greater tendency to require the help of others in their normal environment. During their hospital stay, the active group had more complications detected, new diagnoses and geriatric problems both pre-existent and arising during hospitalization. The differences between these variables were significant (Table 2). Tables 3 and 4 show the differences between the active arm and the control group in terms of personal history, complications, geriatric problems and new diagnoses.

**Table 1.** Complications and new diagnoses during hospital stay in patients admitted for hip fracture over one year

Complications (%)	
Anemia	155 (34.5%)
Malnutrition	135 (30%)
Constipation	96 (21.4%)
Confusional syndrome	95 (21.2%)
Urinary infection	48 (10.6%)
Hydration and electrolyte alterations	45 (9.1%)
Respiratory infections	22 (4.9%)
Fever	21 (4.7%)
New specific diagnoses [n (%)]	
Osteoporosis	140 (31.2)
Arrhythmias	38 (8.5)
Anemia	14 (3.1)
Affective disorders	13 (2.9)
Ischemic cardiopathy	12 (2.7)
Falls	11 (2.4)
Cardiopathy due to hypertension	9 (2)
Stroke	9 (2)
Dementia	7 (1.6)
Thrombopenia	7 (1.6)
Insomnia	6 (1.3)

In the resulting multivariate analysis, the followup by the CGT appears as an independent factor related to undergoing surgery, walking independently on discharge and receiving more than 8 diagnoses during hospitalization. The followup by the CGT was not independently associated with a longer hospital stay.

**Table 2.** Difference at the time of admission between the active arm and the control group.

	Control group (n: 200)	Active arm (n: 202)
Mean age in years (SD)*	81.7 (8)	84.4 (7)
Male sex*	34 (17%)	51 (25%)
Previous average Barthel index (SD)*	79 (25)	72 (27)
High surgical risk patients*, <sup>a</sup>	52 (26%)	109 (54%)
Average number of drugs being taken before admission (SD)*	1.9 (2.2)	3.3 (2.3)
Previous need of social help*	76 (38%)	116 (57%)
Average personal history (SD)**	3.3 (2.2)	5.4 (2.7)
Average complications (SD)***	0.4 (1)	3.8 (2)
Average new diagnoses (SD)***	0.4 (0.8)	2.1 (1.6)
Average geriatric problems during admission (SD)***	0.5 (0.7)	3.6 (1.7)

\*Score on the ASA (*American Society of Anesthesiology*) III or IV.

\*p < 0.05; \*\*p < 0.01; \*\*\*p < 0.001.

SD: Standard Deviation.

**Table 3.** Geriatric problems detected and registered in the patients' clinical record during admission according to group.

Geriatric problems	CGT consulted	CGT not consulted
Lack of mobility	37 (18.3%)	0
Incontinence*	141 (69.8%)	6 (3%)
Cognitive impairment*	124 (61.4%)	57 (28.5%)
Sight impairment*	100 (49.5%)	9 (4.5%)
Hearing impairment*	80 (39.6%)	11 (5.5%)
Social problem	20 (9.9%)	0
Ulcers*	39 (19.3%)	39 (19.3%)

\*p < 0.001.

Other data on the evolution of both groups of patients are given in Table 5.

## DISCUSSION

The primary goal was to determine the type of medical problems that elderly people admitted with a hip fracture usually develop. Table 6 shows the most frequent in-hospital complications found in elderly patients admitted for hip fracture. Confusional syndrome is one of the most frequent diagnoses, found in 50% to 2.8% of cases according to different studies<sup>4,28-30</sup>. In the study carried out by Mullen et al<sup>31</sup>, 26% of the patients suffered confusional syndrome and this variable was related to greater mortality in their group of fragile elderly patients. This result is not rare since it is

**Table 4.** Most frequent complications and new diagnoses according to group.

Complications n (%)	CGT consulted	CGT not consulted
Anemia	148 (73.3)	7 (3.5)
Malnutrition	131 (64.8)	4 (2)
Constipation	90 (44.5)	6 (3)
Confusional syndrome	86 (42.6)	9 (4.5)
Bedsore***	46 (22.7)	11 (5.5)
Urinary infection	41 (20.3)	41 (20.3)
Hydration and electrolyte alterations***	43 (21.3)	2 (1)
Lack of mobility***	37 (18.3)	0
Respiratory infections**	17 (8.4)	5 (2.5)
Fever***	19 (9.4)	2 (1)
Acute urine retention	9 (4.4)	4 (2)
Hyperglycemia***	17 (8.4)	1 (0.5)
New specific diagnoses n (%)	CGT consulted	CGT not consulted
Osteoporosis***	128 (63.6)	12 (6)
Arrhythmias***	34 (16.8)	4 (2)
Anemia**	12 (5.9)	2 (1)
Affective disorders**	12 (5.9)	1 (0.5)
Ischemic cardiopathy*	10 (4.9)	2 (1)
Falls**	11 (5.4)	0
Cardiopathy due to hypertension	6 (3)	3 (1.5)
Stroke	6 (3)	3 (1.5)
Dementia	6 (3)	1 (0.5)
Thrombopenia	6 (3)	1 (0.5)
Insomnia**	6 (3)	0
Valve impairment**	6 (3)	0
Renal failure	4 (2)	1 (0.5)

\*p < 0.05; \*\*p < 0.01; \*\*\*p < 0.001.

**Table 5.** Difference in evolution during hospitalization of patients in the active arm and the control group.

	CGT not consulted	CGT consulted
Not operated**	32 (16%)	16 (7.9%)
Physiotherapy carried out***	133 (66.5%)	169 (83.7%)
Average Barthel at discharge (SD)*	34 (21)	38.5 (21)
Mortality	11 (5.5%)	6 (3%)
Delayed surgery***	2.4 (3.4)	3.8 (3.9)
Average hospital stay***	15.1 (9)	18.7 (6.4)
Transfer to Rehabilitation***	3 (1.5%)	68 (33.7%)

Delayed surgery\*\*\* days from admission until surgery, UME:

UME: rehabilitation or half-way floor; SD: Standard Deviation.

\*\*\*p < 0.05; \*\*p < 0.01; \*\*\*p < 0.001.

known that confusional syndrome is usually related to an underlying organic condition<sup>32</sup>. Anemia was diagnosed in 34.5% of the patients in our study<sup>27</sup> and in other studies it varied from 36% to 5%<sup>7,29,33,34</sup>.

Malnutrition was diagnosed in 30% of the patients in this study. Incalzi et al found malnutrition in 10% of the pa-

**Table 6.** In-hospital complications seen in elderly patients admitted for hip fracture according to several authors.

	Gilchrist <sup>34</sup>	Zuckerman <sup>11</sup>	Harries <sup>33</sup>	Whitaker <sup>29</sup>	Campbell <sup>5</sup>	Campion <sup>28</sup>	Ogilvie-Harries <sup>30</sup>	Clark <sup>7</sup>	Sánchez Ferrín <sup>4</sup>	This study
Anemia	4.9%		22.5%	7.2%				36.7%		34.5%
Malnutrition										30%
Constipation										21.3%
Delirium				12%		49%	2.8%		50%	21.1%
Urinary infection		9.6%		2.4%		33%	2.8%	14.2%	15%	10.6%
Hydration and electrolitical alterations		58.4%	5%							9.1%
Respiratory infections		10.1%	35%	4.8%		19%		29.9%	6%	4.9%
Osteoporosis										
Osteomalacia	2.2%									31.1%
Arrhythmias		12.3%				26%				8.4%
Affective disorders						15%				2.9%
Cardiopathy		3.6%	10%	3.2%		6.8%	2.8%			4.6%
Thromboembolism		7.8%		0.8%	4%		2.8%			0.7%
Dehydration			15%							3.3%
Uncompensated Diabetes			10%							4%

tients, a lower percentage than ours<sup>12</sup>. This variable is not registered in most studies of patients with hip fracture. Urinary infection was found in 10.6% of the patients in this study, a similar percentage to that found by Zuckerman et al (9.6%)<sup>11</sup>.

Other authors presented percentages of urinary infection of 33%-2.4%<sup>4,18,28-30</sup>. Another frequent complication is respiratory infection, from 35%-10% in these patients<sup>4,7,28,29,33,34</sup>. In this study the rate of respiratory infection was 4.9%. In all studies ischemic or hypertensive cardiopathy is seen in about 4% of patients and heart failure in 3%-10%. In ours, this diagnosis was made in 4.7% of patients.

Amongst new diagnoses, osteoporosis was the most frequent, seen in 31.2% of patients in this study. This variable is also not usually registered in other studies, with the exception of the study performed by Campion et al<sup>28</sup>, which mentioned 49% of patients with some risk factor for osteoporosis. The percentage of diagnoses of arrhythmias varies from 8.5% of patients in our study to 26% in others<sup>11,28</sup>. The low incidence of DVT and pulmonary embolism is striking in this study (0.7% and 0.2%, respectively).

In the studies we reviewed the percentages varied from 0.4%-7.8%<sup>11,30,33,36</sup>. In the study performed by Campbell<sup>36</sup> the most frequently detected geriatric problems were bedsores (40%-0.4%<sup>7,34-36</sup>) and incontinence 30%. We detected this in 40.8% of our patients, during their hospital stay (33.6% on admission)<sup>27</sup>.

Most studies do not register problems such as sensorial impairment or social problems. In our study we found sight impairment in 32% of the patients and hearing deficit in 25%; lack of mobility affected 8.2% of patients and social problems about 5%.

As can be seen on reviewing Table 6, this study contributed comprehensive information on the most frequent

complications in an elderly population during the acute phase of hip fracture.

We will now comment on the differences between both groups, thus achieving the second aim of the study which was to determine whether cooperation between orthopedic surgeons and geriatricians benefits this type of patient.

The group in the active arm of the study (CGT consulted) had an average of 3 complications more and 2 new complications more diagnosed than the control group. It must be stated that the group in the active arm of the study on admission had more multiple health conditions than the control group (in fact, on average they had 2 health conditions more in their personal history and 1.72 previous geriatric problems more than the control group).

Moreover, the fact that they have more health conditions diagnosed also means they are predisposed to a greater number of complications. Thus the Mullen and Mullen study<sup>31</sup>, which compared groups of 'healthy' elderly people with another group of 'fragile' elderly people, found that the second group had a greater percentage of complications and a higher mortality rate. On the other hand, there are several studies on the activities of CGT teams that show the benefit, in comparison with elderly patients only treated by non-geriatric specialists, of a greater number of diagnoses<sup>4,15,17,37-39</sup>. In 1992, Gorbien et al<sup>40</sup> published an article where they summarized several articles in a Table showing underdiagnoses; these were more frequent in elderly patients in all environments (hospitals, old-people's homes and in the community).

We will now comment on some specific problems. Of the 21.1% of the patients in this study diagnosed with *delirium*, most were in the active arm. Risk factors identified for *delirium* are: advanced age, previous cognitive impairment and severity of disease and as, contributing factors, some



hypnotic and anticholinergic drugs. Compared with the control group, the patients in the active arm are older, have a higher rate of cognitive impairment and more complications, all of which increases the severity of their disease. These patients also take more drugs, amongst them hypnotics, so it is not strange that they suffer from acute confusional syndrome with greater frequency. The fact that the patients in the control group had a higher rate of prescription of neuroleptic drugs (27%) leads us to think that there were more patients with *delirium* in this group than those registered with this condition in their clinical history. On the other hand, the presence of *delirium* has been related to a greater probability of institutionalization, more complications, longer hospital stays and greater mortality<sup>41,42</sup>. In those patients in the group in the active arm that had a higher rate of *delirium* we did not find an increase in mortality or institutionalization. Anemia was diagnosed in 34.5% of the patients in this study, 74% in the group in the active arm and 3.5% in the control group. But in the control group there are 65% of patients with low hemoglobin levels that are not diagnosed with anemia. Malnutrition is diagnosed in 64.8% of the patients in the active arm and 2% in the control group.

In this study a greater number of urinary and respiratory infections were found in the active arm than in the control group. Sánchez-Ferrín et al<sup>4</sup> and Zuckerman et al<sup>11</sup> found no differences in respiratory and urinary infections between both groups. Amongst the new health conditions diagnosed osteoporosis was the most frequent, and there was a statistically significant difference between the percentages found in the active arm (63.6%) and the control group (6%). In a study performed by Arnal et al<sup>43</sup> on a group of patients that had suffered hip fracture, it was seen that all patients that underwent densitometric studies of the contralateral hip had severe osteoporosis. After iliac crest biopsy, a decrease of BMD was found in 50% of patients and osteomalacia in 24%. In this study we found ulcers, throughout admission, in 19.3% patients in the active arm and 3% in the control group.

We believe that this is due to the fact that these are patients with a worse general health status, more multiple pathologies and a greater degree of malnutrition and also that the CGT registered a greater number of problems. It is important to point out that in some studies there are significant differences between the active arm and the control group, with less ulcers in the active arm<sup>4,19</sup>. Visual and hearing deficits are more frequently diagnosed in the active arm than in the control group. Social problems and lack of mobility were only diagnosed in the active arm. We found no data on these variables in the comparative studies we reviewed.

In the results seen in this study, the patients with hip fracture in the active group are older, have more conditions diagnosed, greater functional and mental impairment

and are in a worse social situation. This group of patients not only had more previous diseases before their hip fracture, but these conditions also cause them greater disability (hypertension, dementia, diabetes, stroke, depression, Parkinson, deafness), all of which worsens their already poor baseline condition. This means that the active arm contains a greater number of "geriatric patients". And it is precisely these patients that benefit most from the care provided by a CGT. Our hospital CGT had been working for several years before this study was performed and the orthopedic surgeons requested consultations, especially about cases related to geriatric patients. On the other hand, according to the results of this study, in spite of the fact that the patients treated by the CGT had a worse baseline condition than the control group, their evolution during hospitalization was not worse, but, on the contrary, on discharge they are better off from the functional point of view, have carried out more physiotherapy and have been seen more times (Table 5). Furthermore, patients in the active arm had a higher rate of malnutrition, *delirium* and bedsores, all of which are usually predictors of a poor evolution (longer hospital stay, more complications and greater mortality). However, a longer hospital stay was not seen in these patients and also, their mortality rate was lower, although this was not statistically significant<sup>20,27</sup>.

The fact that geriatricians detect more clinical problems in geriatric patients means that they require further care and treatment of these problems and, probably means that they will have a better clinical and functional evolution.

A recent systematic review of different forms of care of this condition shows that geriatric care programs directly applied in the orthopedic department during the acute phase provide patients with a better functional recovery and a shorter mean hospital stay. In addition, more patients return to their homes and there is an overall reduction in health costs<sup>44</sup>. Furthermore, this at least provides us with a practical clinical guideline in which early geriatric assessment and followup are considered essential components in the treatment of elderly patients with hip fractures with an 'A' degree of recommendation, that of the highest level of evidence<sup>45</sup>.

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