BJR

■ **SYSTEMATIC REVIEW**

Should concurrent viral (including COVID-19) or bacterial infections be treated before performing surgery for hip fracture?

A SYSTEMATIC REVIEW

E. Guerado,
J. R. Cano,
J. Pons-Palliser

From Hospital Universitario Costa del Sol, University of Malaga, Marbella, Spain

Aims

A systematic literature review focusing on how long before surgery concurrent viral or bacterial infections (respiratory and urinary infections) should be treated in hip fracture patients, and if there is evidence for delaying this surgery.

Methods

A total of 11 databases were examined using the COre, Standard, Ideal (COSI) protocol. Bibliographic searches (no chronological or linguistic restriction) were conducted using, among other methods, the Patient, Intervention, Comparison, Outcome (PICO) template. We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines for flow diagram and checklist. Final reading of the complete texts was conducted in English, French, and Spanish. Classification of papers was completed within five levels of evidence (LE).

Results

There were a total of 621 hits (526 COre; 95 Standard, Ideal) for screening identification, and 107 records were screened. Overall 67 full-text articles were assessed for eligibility, and 21 articles were included for the study question. A total of 46 full-text articles were excluded with reasons. No studies could be included in quantitative synthesis (meta-analyses), and there were many confounding variables including surgeons' experience, prosthesis models used, and surgical technique.

Conclusion

Patients with hip fracture and with a viral infection in the upper respiratory tract or without major clinical symptoms should be operated on as soon as possible (LE: I-III). There is no evidence that patients with coronavirus disease 2019 (COVID-19) should be treated differently. In relation to pneumonia, its prevention is a major issue. Antibiotics should be administered if surgery is delayed by > 72 hours or if bacterial infection is present in the lower respiratory tract (LE: III-V). In patients with hip fracture and urinary tract infection (UTI), delaying surgery may provoke further complications (LE: I). However, diabetic or immunocompromised patients may benefit from immediate antibiotic treatment.

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Correspondence should be sent to Enrique Guerado; email: eguerado@hcs.es

Article focus

■ Is there evidence for delaying hip fracture surgery in patients with viral or bacterial infections?

■ How long before surgery should concurrent infection (respiratory and urinary tract infections (UTIs)) be treated in hip fracture patients (HFX)?

Key messages

■ The prevention of pneumonia is a major issue for HFX. To do so, the key aspect is to avoid delay in performing the surgical intervention (highest level of evidence (LE): II). Patients with a viral infection in the upper respiratory tract (even those with asthma) have not been shown to be at risk of postoperative pulmonary complication; therefore, surgical intervention for hip fractures should not be delayed (LE: V). There is no evidence that coronavirus disease 2019 (COVID-19) infections should be treated differently.

■ Antibiotics should be administered if the fracture surgery is delayed by > 72 hours or if bacterial infection is present in the lower respiratory tract (LE: V).

■ The studies analyzed do not favour delaying surgical treatment unless the patient has major clinical impairment (LE: I-III). Therefore, it can be concluded that clinically fit patients with pneumonia should be operated on as soon as possible.

■ In HFX, a concurrent asymptomatic UTI should not be treated, as this delays surgery and may provoke further complications (LE: I). Only diabetic or immunocompromised patients may benefit from immediate antibiotic treatment (LE: II); however, surgery should not be delayed for longer than about 48 hours (LE: II).

Strengths and limitations

■ The methodology (a combination of: COre, Standard, Ideal (COSI) protocol; Patient, Intervention, Comparison, Outcome (PICO) template; and Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist and flow diagram) is a strength of this paper.

■ The studies retrieved in the present research did not allow a quantitative approach for the interpretation and presentation of the results. Therefore meta-analysis could not be performed. This is a limitation.

■ One strength is that several conclusions reached LE: I or II. However, there was a high data dispersion. The majority of the papers selected included aggregations (e.g. total with hemiarthroplasty, cementation with no cementation). A limitation is that some papers were designed to study blood loss, length of hospital stay, body mass index, myocardial infarction, or type of anaesthesia, rather than the key questions of this study.

Introduction

Hip fractures are an increasingly serious public health problem. Worldwide, their total annual number is expected to surpass six million by the year 2050.[1] Current treatment for hip fracture is usually surgical, consisting of either osteosynthesis or arthroplasty for extracapsular and intracapsular fractures, respectively.[2] Hemiarthroplasty (HA) is indicated in cases of proximal femoral neck fracture, particularly in frailer, older patients, while fitter patients are treated with total hip arthroplasty (THA) or bipolar prostheses.

Complications among older patients have raised concerns about the need to identify determinant variables for surgical site infection (SSI), such as urinary tract infection (UTI) and respiratory infection.[3,4]

The objective of this paper was to determine whether hip fracture surgery should be delayed and if so, for how long in case of nosocomial infection.

Methods

Search process. Many studies have been undertaken to identify the determinants of infection.[5–22] The databases considered for the bibliographic search were all accessible through our cooperative online library, Biblioteca Virtual del Sistema Sanitario Público de Analucía (BVSSPA). The papers were selected using the COSI (COre, Standard, Ideal) protocol (Figure 1).[23] The following databases were examined: MEDLINE (PubMed)/Ovid-MEDLINE/Embase/SPORTDiscus/Cochrane Library/Web of Science/Scielo/Current Contents/PEDro/CINAHL (Nursing Ovid)/Google Scholar. Bibliographic searches were carried out using the Patient, Intervention, Comparison, Outcome (PICO) template,[24] and adapted to the interrogation programmes available for each database and their possibilities; both free language (titles and abstracts) and controlled languages (MeSH, Entrez, etc.) were used. Subheadings and filters, both thematic and methodological, were applied.

There was no chronological or linguistic restriction on the bibliographic searches, before the final reading of the complete texts in English, French, or Spanish.

All queries and search stages were performed with Boolean operators (AND, OR, NOT, NEAR, ADJ, etc.).[25] For each question, the papers were retrieved and selected according to the title and the summary abstract in each case. Subsequently, a manual search was made of relevant citations within the selected complete texts. Data storage, elimination of duplicates, and final edition were performed using the Endnote bibliographic reference manager [26] and the Google Drive platform[27] . These tools were also used for the exchange of documentation among the review team. Before the review was performed, a checklist for the extraction of data was also prepared. A Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram for study selection was followed (Figure 2).[23]

Eligibility criteria. All articles with the key words and terminology included in Table I were selected and reviewed
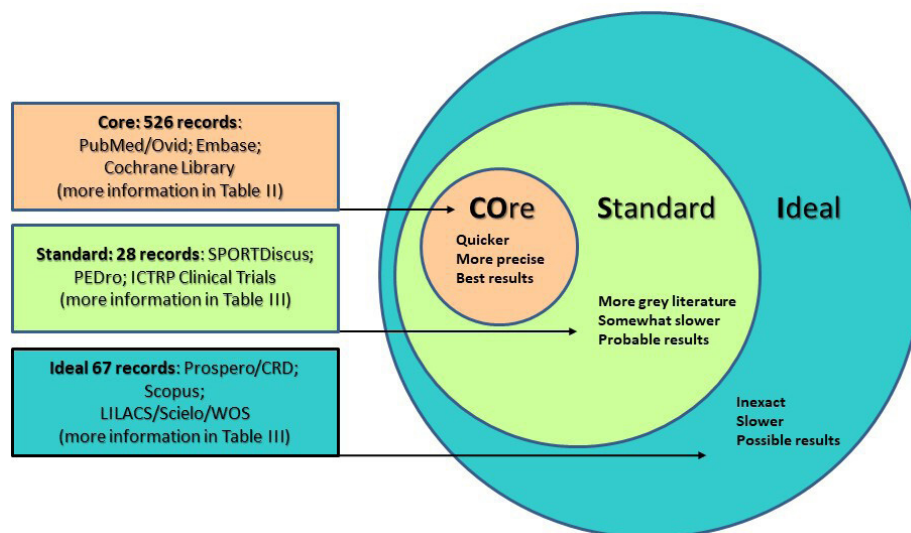
Fig. 1

Databases consulted: COre, Standard, Ideal (COSI) methodology search. CRD, Centre for Reviews and Dissemination; ICTRP, International Clincal Trials Registry Platform; WOS, Web of Science.

following the PRISMA flow diagram (Figure 2), as stated above.

Exclusion criteria. After applying the above inclusion criteria to select the articles for review, they were retrieved and their title abstracts and method descriptions were read. We then excluded papers consisting of abstracts alone, conference presentations, commentaries, review articles, update papers, and letters to the editor. Papers written by the same authors were meticulously compared in order to discard repeated studies (Figure 2).

Data extraction. To address the review question, the following details were extracted: sex; demographic characteristics; primary diagnosis; current diagnosis; concurrent acute and chronic diagnosis and treatment; arthroplasty type; time between diagnosis and treatment; and complications, with special emphasis on infection: location, treatment, etc.; and outcome. We paid particular interest in the time elapsed between locating the infection and the provision of treatment before surgery. The entire bibliographic search was conducted by the specialist librarian (JPP) in the presence of one of the orthopaedic surgeons (EG). Data extraction was performed, in an independently peer-reviewed approach, by two reviewers (EG, JRC) and any conflicts were resolved by consensus. The two orthopaedic surgeons in the group are senior consultants with many years of experience of hip surgery. The papers were extracted after constructing a set of PICO questions.[24] These questions specified the patient population of interest (P), the intervention of interest (I), the comparisons of interest (C), and the patient-oriented outcomes of interest (O). Then they were classified by I to V evidence strength levels:[24,28–30] I: randomized controlled trial (RCT), including meta-analysis of RCTs; II: prospective cohort study; III: retrospective cohort study; IV: case series; and V: mechanism-based reasoning.[28]

Statistical analysis. SPSS Statistics v.24 software (IBM, Armonk, New York, USA) was used to analyze the data for the following descriptive statistics: frequencies (as percentages) of the categorical variables and mean values for the continuous ones. In addition, we intended to perform multiple logistic regressions to detect the determinant variables, but because of the disparity of the studies it was not possible to conduct a meta-analysis.

The study question was as follows: "How long should concurrent infections (either respiratory or urinary tract) be treated before surgery in hip fracture patients?"

For the study question, the PICO terms were: P: femoral neck fracture, hip fracture; I: delay surgery; C: before surgery, how long, time factors; O: rate of infection, pneumonia, SSI, joint infection, prosthesis-related infection, UTI (Table I).

Results

The results of the 11 databases were examined using the COSI protocol, as shown in Figure 1 and Tables II and III. The PRISMA flow diagram is shown in Figure 2. Studies included are shown in Table IV.

We identified 21 papers that were relevant to this question according to the search criteria shown in Table I. The results of this selection are shown in Table IV. One paper had evidence level I.[16] Five papers with evidence level II focused on UTI,[6,8,13,15,18] and two of these also addressed respiratory infection.[6,8] A total of 11 papers had evidence level III.[7,11,12,14,17,19–22] Six of them concerned UTI,[7,14,19,22] four pneumonia,[12,17,20,21] and one both UTI and pneumonia.[11] Only four papers had evidence level V: three concerned UTI[5,10,32] and one discussed respiratory assessment for patients with hip fracture (HFX).[9]
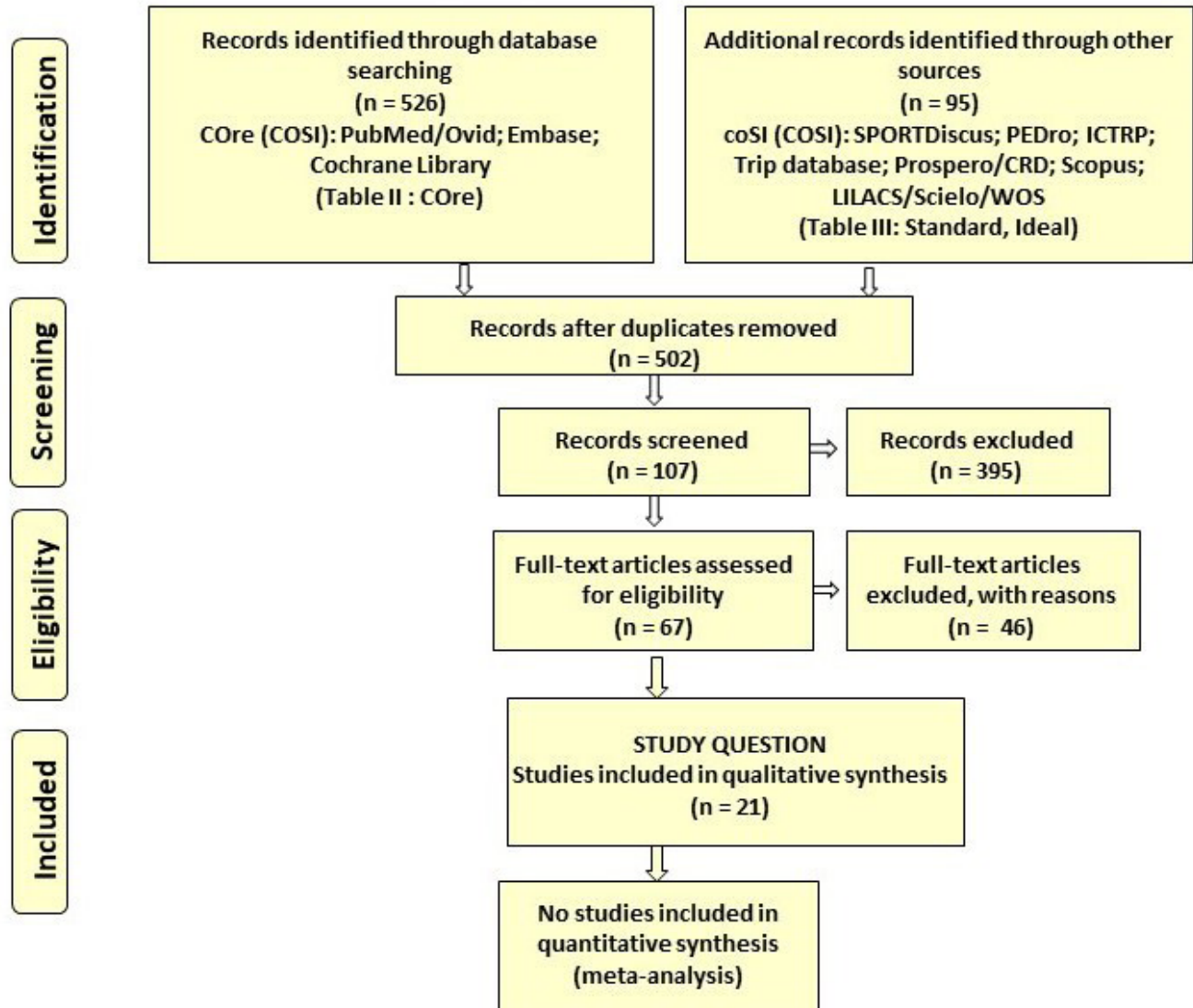
Fig. 2

Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram of studies selection. ICTRP, International Clinical Trials Registry Platform; WOS, Web of Science.

Table I. Equation for the study question, which included surgical intervention (prosthesis), complications (infection), and time (before/delayed surgery, duration, and other factors relating time and infection).

Rate of infection **OR** Pneumonia **OR** Urinary tract infection **OR** Surgical site infection **OR** Joint infection **OR** Prosthesis-related infection
AND
Delayed surgery **OR** Before surgery **OR** How long **OR** Time factors
AND
Hip fractures

Pneumonia. Patients with viral infection in the upper respiratory tract, even asthmatic patients, are not at risk of postoperative pulmonary complication, and therefore surgical intervention for hip fractures should not be delayed (LE: V).[9] Prophylactic antibiotics targeting *Staphylococcus aureus*, which are commonly given before hip fracture surgery to prevent wound infections, are also effective in reducing the risk of respiratory tract infection by bacteria. Antibiotics should also be administered when fracture surgery is delayed due to bacterial infection in the lower respiratory tract, in order to treat the infection and to prevent a SSI (LE: V).[33] In the presence of risk factors such as advanced age, poor general health status, current infections, underlying cardiopulmonary diseases, hypoalbuminaemia, or impaired renal function, preoperative interventions such as lung expansion techniques, antibiotics, and thromboprophylaxis should be employed in order to minimize the pulmonary risk. Regional anaesthesia achieves lower rates of pneumonia and respiratory failure than operations conducted under general anaesthesia (LE: V).[9]

Table II. Databases consulted (COre): MEDLINE, Embase, Cochrane Library.

COre	MEDLINE (PubMed/Ovid)	Embase	Cochrane Library
Date of search	Database segment	Database segment	Database segment
01.06.18 to 15.12.18	1983-2018/1946-2018	1971 to 2018	1989 to 2018
Removed duplicates	Results = 328+169 (497)	Results = 22	Results = 7

Table III. Databases consulted (Standard, Ideal): SPORTDiscus, PEDro, International Clinical Trials Registry Platform, Trip database, Prospero/Centre for Reviews and Dissemination, Scopus, Latin American & Caribbean Health Sciences Literature/Scielo/Web of Science.

Standard, Ideal	SPORTDiscus	PEDro	ICTRP	Trip database	Prospero/CRD	Scopus	LILACS/Scielo/ WOS
Date search	DB segment	DB segment	DB segment	DB segment	DB segment	DB segment	DB segment
1.06.18 to 15.12.18	1985 to 2018	1929 to 2018	2009 to 2018	1997 to 2018	1960 to 2018	1970 to 2018	1997 to 2018
Removed duplicates	Results 16	Results 1	Results 3	Results 8	Results 4	Results 47	Results 16

CRD, Centre for Reviews and Dissemination; DB, database; ICTRP, International Clinical Trials Registry Platform; LILACS, Latin American & Caribbean Health Sciences Literature; WOS, Web of Science.

Patients admitted with a hip fracture and a chest infection are at high risk of mortality within 30 days. This is also true for patients with a coronavirus disease 2019 (COVID-19) infection.[34]

In a retrospective series, other authors have reported that male sex, older age (especially > 90 years), low body mass index (BMI), and chronic obstructive pulmonary disease have the strongest risk for pneumonia (LE: III).[17] For COVID-19, the first two risk factors are the same, i.e. older age and male sex, but patients most at risk are those with a high BMI rather than a low one.[34]

Although published studies give no indication of the optimal time for surgery, it has been shown that a delay between occurrence of the fracture and seeking hospital treatment is associated with increased mortality, particularly when this delay exceeds four days (LE: II).[6]

In a study of patients diagnosed with Garden IV hip fractures treated by HA, 25 of the 290 patients developed pneumonia. A significant association was observed between the development of pneumonia and a delay in surgery because of transfusion. In view of these findings, the authors consider that special attention should be paid to reducing delays in surgical treatment for HFX in order to minimize possible complications; thus, transfusion should be followed by early intervention whenever possible (LE: II).[8]

In another study, 26 of 642 patients developed pneumonia. According to the authors, preoperative chest radiographs to screen HFX should only be requested in patients with clinical abnormalities, as the value of this procedure is limited and in only 0.6% of such cases does an abnormality necessitate postponing the operation (LE: III).[20] A study of 185 HFX found that 16 had developed pneumonia requiring antibiotic treatment and delayed surgery. These authors concluded that a one-week delay in providing surgical treatment for such patients did not increase mortality, but was associated with a raised incidence of postoperative complications, leading them to advise that HFX should be operated on as soon as their medical condition permits (LE: III).[11]

In a paper including 7,128 HFX, 82 had preoperative pneumonia, making them very susceptible to complications and death after hip fracture treatment, especially if their condition was accompanied by low body weight. Nonetheless, these authors did not advise against early hip fracture surgery for these patients (LE: III).[21]

Finally, a retrospective review of 467 patients found that the most common cause of death in HFX was pneumonia (this being five times more frequent than the next most common cause). However, these authors also observed that earlier surgery was associated with lower mortality and a lower risk of postoperative pneumonia (LE: III).[12]

Urinary tract infection. Asymptomatic patients with UTI do not demonstrate any benefit from treatment, consequently nor do they show any benefit from delay of surgery (LE: I).[16] In contrast, diabetic or immunocompromised patients may benefit from antibiotic treatment (LE: II).[15] However, even in these patients, higher complication rates might be provoked if their treatment is delayed for longer than 48 hours (LE: II).[13] Other studies have reported that this 48-hour delay could be increased to four days (LE: II)[6] or even one week (LE: III).[11]

One study found that immediate antibiotic treatment for prevalent bacteriuria, for five days, decreased the risk of SSI after surgery for hip fractures; in this study, the authors started the antibiotic treatment but did not delay the surgery (LE: III).[19]

Discussion

Most clinical questions related to infection in HFX can be broken down into components that correspond to two or more PICO terms.[24] The PICO terms thus identified can then be used in the bibliography search using MeSH terms.[29] Systematic reviews can be performed in two ways: as a quantitative synthesis or meta-analysis, or by taking a qualitative or overview approach.[30] However, the studies retrieved in the present case allowed only a qualitative means to be adopted for the interpretation and presentation of the results.

Table IV. Characteristics of studies included in addressing the study question: "How long should concurrent infections (either respiratory or urinary tract) be treated before surgery in hip fracture patients?"

Study	Journal	Year	Country	Type of study	Level of evidence	Number of patients	Mean age, yrs	Odds ratio	Percentage of surgical site infection	Diagnosis/hip implant
Otermin et al[10]	Enferm Infecc Microbiol Clin	2009	Spain	letter	V	1,000	71	unknown	Aggregates THA & TKA, spinal arthrodesis & others	Several/cemented & uncemented THA
American Urological Association and AAOS[5]	J Urol	2003	USA	advisory statement	V	unknown	unknown	unknown	Aggregates THA & TKA	Several/cemented & uncemented THA & HA
Bouvet et al[15]	Bone Joint J	2014	Switzerland	prospective	II	615	69	unknown	Aggregates THA & TKA	Several/cemented & uncemented THA
Yassa et al[22]	JRSM Open	2017	UK	retrospective	III	460	80.9	unknown	12.4%	Fracture/cemented & uncemented THA & HA
Ashraf and Umer[14]	J Pak Med Assoc	2014	Pakistan	retrospective	III	84	63.5	unknown	Unknown: study UTI patients	UTI/fracture cemented (& uncemented?) HA & osteosynthesis
Bliemel et al[18]	Geriatr Gerontol Int	2017	Germany	prospective	II	402	81	1,185 (no differences between UTI and wound infection or in-hospital mortality)	1.7%	Fracture/osteosynthesis & unknown arthroplasty type cemented & uncemented?
Poh and Lingaraj[13]	J Orthop Surg (Hong Kong)	2013	Singapore	prospective	II	294	78	1,042 (age); 2,273 (ASA equal to or above 3);[31] 1,766 (time > 48 hrs); risk factors are unspecified	unknown	Fracture/osteosynthesis & unknown arthroplasty type cemented & uncemented?
Kamel[7]	J Am Med Dir Assoc	2005	USA	retrospective	III	138	< 65: 16 to 65; > 65:65 to 96	unknown	Unknown: study UTI patients	Fracture/unknown arthroplasty type cemented & uncemented?
Langenhan et al[19]	Int Orthop	2018	Germany	retrospective	III	1,089	83.19	unknown	Unknown: study only patients with SSI	Fracture/cemented & uncemented THA & HA
Loggers et al[20]	Eur J Orthop Surg Traumatol	2017	The Netherlands	retrospective	III	642	83	unknown	Unknown: study chest radiograph abnormalities	Fracture/cemented & uncemented THA & HA & osteosynthesis
Moran et al[6]	J Bone Joint Surg Am	2005	USA	prospective	II	2,093	80	unknown	1.1%	Fracture/cemented & uncemented HA & osteosynthesis
Rodriguez-Fernandez et al[11]	Clin Orthop Relat Res	2011	Spain	retrospective	III	185	82.5	unknown	unknown	Fracture/cemented & uncemented HA & osteosynthesis
Zalmanovici Trestioreanu et al[16]	Cochrane Database Syst Rev	2015	Israel	systematic review	I	1,614	unknown	unknown	Unknown: study antibiotics treatment for asymptomatic bacteriuria in elderly patients	unknown
Lo et al[9]	Osteoporos Int	2010	China	review paper	V	unknown	unknown	unknown	unknown	Fracture/unknown arthroplasty & osteosynthesis

Continued

Table IV. Continued

Study	Journal	Year	Country	Type of study	Level of evidence	Number of patients	Mean age, yrs	Odds ratio	Percentage of surgical site infection	Diagnosis/hip implant
García-Alvarez et al[8]	Arch Gerontol Geriatr	2010	Spain	prospective	II	290	85.4	unknown	21.1% (sic*)	Fracture/cemented HA
Patterson et al[21]	Am J Orthop	2017	USA	retrospective	III	7,128	unknown	unknown	Unknown: study only pneumonia	Fracture/cemented & uncemented HA & osteosynthesis
Khan et al[12]	Int Orthop	2013	Germany	retrospective	III	467	81.6	2.19 (time to surgery > 48 hrs); 3.31 (history of cardiac disease); 3.56 (admission other than own home); for mortality, not for infection, and only for hip fracture	Unknown: study only mortality (sic)	Fracture/cemented & uncemented HA; probably also osteosynthesis
Nicolle et al[32]	Clin Infect Dis	2019	USA	advisory statement	V	unknown	unknown	unknown	Aggregates THA & TKA	Several/cemented & uncemented unknown

*Includes any surprising assertion, faulty reasoning, or other matter that might be likely interpreted as an error of transcription.
AAOS, American Academy of Orthopaedic Surgeons; ASA, American Society of Anesthesiologists; HA, hemiarthroplasty; SSI, surgical site infection; THA, total hip arthroplasty; TKA, total knee arthroplasty; UTI, urinary tract infection.

The articles examined in this systematic review include not only hip fracture studies, but also papers that concern implants or more general conditions (such as urological infection or pneumonia). These papers deal with infection as a complication and present aggregated data, which makes it impossible to stratify the risk factors of HFX. Furthermore, even when the patient risk factors can be stratified, they differ between the papers considered. A number of the papers selected include aggregations, e.g THA with HA or cementation with no cementation (Table IV). In addition, data were also retrieved from papers that were not primarily examining infection, such as studies reporting on blood transfusion, length of hospital stay, BMI, myocardial infarction, or type of anaesthesia. Moreover, some of the papers reported the use of different antibiotic prophylaxis regimens. As a result, it was not possible to isolate data related to our study question and using these data would have resulted in selection bias of patients with certain conditions. Therefore, due to the disparity of the studies, a meta-analysis was not performed.

Respiratory infection. Very little research has been published concerning chest infection before or after surgical treatment for hip fracture. However, published studies concur on the importance of preventing and treating pneumonia.

Prevention of pneumonia is especially critical as it is the most common cause of death in HFX (and is five times more frequent than the next most common cause) – although, interestingly, there is no agreement on whether pre-existing chronic pulmonary obstruction correlates with pneumonia (LE: III).[12,17] The published studies, however, are in agreement that the key aspect in the prevention of pneumonia is to avoid delay in performing the surgical intervention.[6,8,9,11,12]

Of particular note is that when there is viral infection in the upper respiratory tract, there is little risk of postoperative pulmonary complication, and therefore surgical intervention for the hip fracture should not be delayed (LE: V).[9]

At present, there is no evidence that patients with COVID-19 should be treated differently and therefore unless they are considered to be moribund, they should also undergo surgery without delay.[34]

However, if surgery is delayed by more than 72 hours or if pneumonia develops, antibiotics targeting *S. aureus* should be given for the chest and to prevent SSI. In the literature, various antibiotics have been recommended. In particular, cephalothin 1 g administered intravenously every four hours for 72 hours is frequently reported and is recommended by Cochrane,[33] however our database shows that this recommendation should be considered evidence level V. One study reported that delaying surgery in patients with a chest infection for one week did not increase mortality, but was associated with a raised incidence of postoperative complications (LE: III).[11] Thus, even this study supported the principle of early surgical intervention.
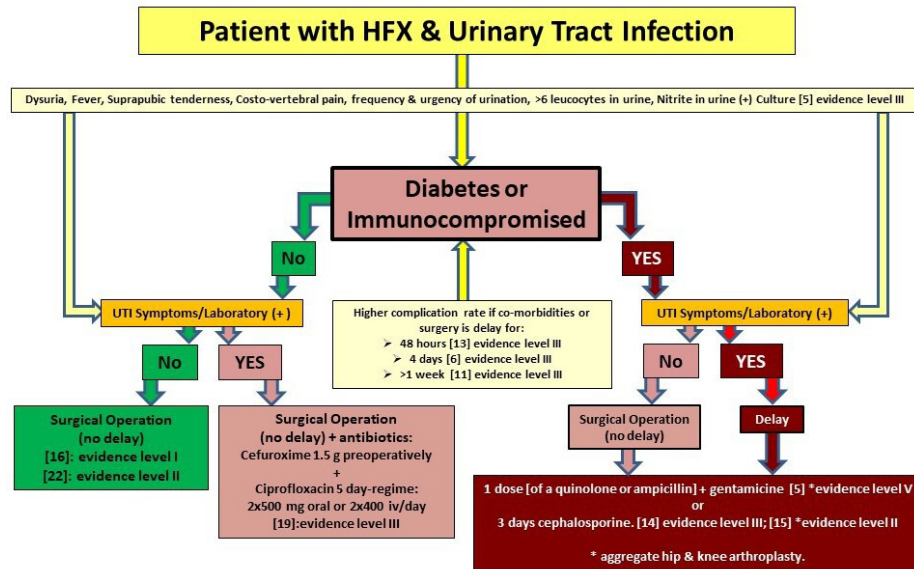
Fig. 3

Algorithm for patients with urinary tract infection (UTI). It should be noted that this is a suggested pathway, and patients should be managed on a case-by-case basis. HFX, hip fracture; iv, intravenous.
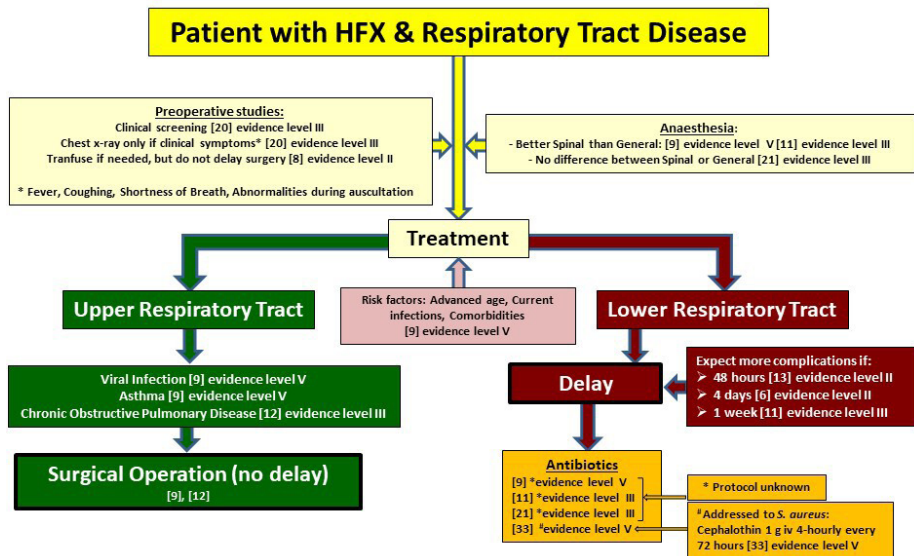
Fig. 4

Algorithm for patients with respiratory tract disease. It should be noted that this is a suggested pathway, and patients should be managed on a case-by-case basis. HFX, hip fracture; iv, intravenous; *S. aureus*, *Staphylococcus aureus*.

Urinary tract infection. Urinary tract infections can be clinically divided into symptomatic or asymptomatic. Asymptomatic UTI is defined as the absence of dysuria, fever, suprapubic tenderness, costovertebral pain, frequency or urgency of urination, urine presenting more than six leucocytes per high-power field or nitrite positive, and confirmed with positive urine culture (LE: V).[5]

For asymptomatic patients, treatment can help eradicate urinary pathogens but at the risk of more pharmacological adverse events and a longer preoperative stay. Since there is a lack of correspondence between bacteriuria and UTI symptoms, many patients remain undetected, making the value of screening for UTI very questionable (LE: II).[16]

Since asymptomatic UTI does not provoke a harmful effect, delaying surgery is unwarranted, as high complication rates have been reported in patients whose hip fracture treatment is delayed for longer than 48 hours (LE: II).[13]

However, some authors have suggested that delaying surgery for up to one week does not increase the complication rates (LE: II and III),[6,11] although the consensus in

the literature is that there are harmful effects of delaying surgery when the patient presents with asymptomatic UTI (LE: II),[22] particularly regarding the development of a UTI itself if the patient is not well hydrated (LE: III).[7] Therefore, clinically fit patients with UTI should be operated on as soon as possible (Figure 3).

Although all the above-cited studies recommend proceeding with surgical treatment for hip fracture despite asymptomatic UTI, an evidence level III study concluded that treatment for asymptomatic UTI was imperative. These authors considered that a course of antibiotics for less than three days should be considered as incomplete treatment, since these patients were at risk of a higher incidence of wound infection (LE: III).[14] However, this case series of 84 HFX was selected, with all having UTI; 56% of these patients also had diabetes mellitus, which could explain the high incidence of SSI (16.7%) in this series of patients (Figure 3).

A further study also supported a longer duration than three days; these authors recommended that immediate antibiotic treatment for prevalent bacteriuria should last for five days because it decreases the risk of SSI after surgery for HFX (LE: III).[19]

In conclusion, patients with a viral infection in the respiratory tract (even those with COVID-19 or asthma) have not been demonstrated to be at risk of postoperative pulmonary complications; therefore, surgical intervention for hip fracture should not be delayed (LE: V). However, antibiotics should be administered if the fracture surgery is delayed by > 72 hours or if bacterial infection is present in the lower respiratory tract (LE: V). In general, the studies analyzed do not favour delaying surgical treatment unless the patient presents a major clinical impairment (LE: I to III). Therefore, it can be concluded that all clinically fit patients with respiratory infection should be operated on as soon as possible (Figure 4).

In HFX, a concurrent asymptomatic UTI should not delay surgery (LE: I). Only diabetic or immunocompromised patients may benefit from immediate antibiotic treatment (LE: II); however, even in these patients, surgery should not be delayed for longer than 48 hours (LE: II). Therefore, it can be concluded that clinically fit patients with UTI should be operated on as soon as possible (Figure 3).

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Author information:
- E. Guerado, MD, PhD, FRCS, Professor and Chairman
- J. R. Cano, MD, PhD, Consultant Orthopaedic Surgeon
  Department of Orthopaedic Surgery and Traumatology, Hospital Universitario Costa del Sol, University of Malaga, Marbella, Spain.
- J. Pons-Palliser, PhD, Senior Librarian, Medical Library, Hospital Universitario Costa del Sol, University of Malaga, Marbella, Spain.

Author contributions:
- E. Guerado: Conceptualized and designed the study, Performed the database management, Designed the search strategy, Collected and compiled the data, Analyzed the results, Advised on keywords and concepts, Wrote the manuscript.
- J. R. Cano: Designed the study and search strategy, Performed the database management, Collected and approved the data, Analyzed the results, Wrote the manuscript.
- J. Pons-Palliser: Designed the study and search strategy, Performed the database management, Approved the data, Wrote the manuscript.

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