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Interdisciplinary care of hip fractures. Orthogeriatric models, alternative models, interdisciplinary teamwork

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A B S T R A C T

Hip fractures are common among older people, and the prognosis is serious in terms of mobility, independence in daily life activities, and cognition, with 42% of patients never achieving the same function as before the fracture. Norway has the highest incidence of hip fractures, and the important tasks are to improve patient care and prevent new fractures.

The aim was to develop Norwegian Guidelines for Interdisciplinary Care for Hip Fractures, which included models of care, organization, and clinical issues. These guidelines were based on review of the literature, including existing guidelines such as the NICE guidelines, as well as clinical experience of the members of the group, where consensus was reached after discussions. The guidelines focus on interdisciplinary patient management through a clinical pathway from admission to discharge. Here, we will present a shortened and internationally adapted version of these guidelines, which has newly been released.

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Introduction

Norwegian Guidelines for Interdisciplinary Care of Hip Fractures are a result of collaboration between three Norwegian societies: orthopedic surgeons, geriatricians, and anesthesiologists. The guidelines are based on review of the literature, including existing guidelines such as the NICE guidelines (https://www.nice.org.uk/guidance/cg124) [1] and clinical experience of the members of the group, where consensus was reached after discussions. Here, we have translated, shortened, and adapted the guidelines for international readers.

Norway has the highest incidence of hip fractures (neck of femur, pertrochanteric, and subtrochanteric fractures) in the world. For people aged more than 50 years, the age-adjusted incidence of hip fractures is estimated at 82 per 10,000 women and 39 per 10,000 men [2]. A study of 364 patients with hip fractures in Oslo in 2005–2006 showed a median age of 84 years; of them, 43% had probable dementia at the time of the fracture, and they used on average four medications daily, and 46% had delirium in the perioperative phase [3]. Delirium is an important predictive factor for dementia, loss of function, and death [4]. The prognosis after a hip fracture is serious in terms of mobility, independence in daily life activities, and cognition, with 42% of patients never achieving the same function as that before the fracture [5]. In 2016, 30-day mortality was 7.7%, and 1-year mortality was 24% in Norway (https://www.kvalitetsregistre.no/registers/525/resultater/919).

A hip fracture is usually an injury in an older individual characterized by general vulnerability [6–8]. Rapid, gentle, and good surgical repair of the injury is lifesaving and prevents complications, and certainly, it has the highest priority. This requires a well-defined care pathway and a good collaboration between orthopedic surgeons and anesthesiologists. Primary insertion of prosthesis is the preferred treatment for the majority of cases with neck of femur fractures [9], while per- and subtrochanteric fractures are treated by internal fixation, sliding hip screw, or intramedullary nails (https://www.nice.org.uk/guidance/cg124). Recently published data from the Norwegian National Hip Fracture Registry for the last 10 years show a decreasing risk of reoperation and death in the first year after the fracture [10].

The aim of the treatment of a hip fracture is that the patients as soon as possible regain their pre-fracture function. To achieve this, the patient should be admitted to hospital as quickly as possible, given adequate pain relief, and optimal surgical treatment with minimal complications. In the post-operative phase, early mobilization and exercise are essential. The stay in hospitals should be as short as possible and also sufficiently long for the best possible long-term results [5,11]. The discharge must be well planned, preferably to the patient's own home but, if necessary, to an institution for further rehabilitation. Responsibility for follow-up must be clearly defined.

Orthogeriatric care

The concept of orthogeriatric care, structured orthopedic-geriatric cooperation, is not new. In United Kingdom (UK), orthopedic surgeons and geriatricians have collaborated for many years on the treatment of older people with low-energy fractures. National guidelines for hip fracture care have been developed, highlighting orthogeriatric treatment models in the UK (https://www.nice.org.uk/guidance/cg124) and Australia and New Zealand (http://anzhfr.org/wp-content/uploads/2016/07/ANZ-Guideline-for-Hip-Fracture-Care.pdf). According to best practice reimbursement for patients with hip fractures in England, there is currently a requirement of an orthogeriatric approach including the assessment of osteoporosis to obtain the highest refund. This is also about to be established in several other countries, probably because such a “reward” delivers better outcomes [12].

Norwegian studies of orthogeriatric models

In Norway, the concept orthogeriatric treatment of hip fracture patients has been limited until recently. Few hospitals have established orthogeriatric wards, and direct copying of models from other countries to Norwegian conditions has been hampered by differences in organization of health services.

However, recently there have been breakthroughs for orthogeriatric care in Norway, which has also been noted internationally. Two randomized controlled trials conducted at Oslo University Hospital, Ullevaal, and St. Olavs Hospital, University hospital of Trondheim, tested models of orthogeriatric care in hip fractures [13,14]. Both studies tested models in which treatment in an orthogeriatric department located in a geriatric ward was compared to traditional treatment in orthopedic trauma units. For both treatment groups, orthopedic surgeons and anesthesiologists were as usual responsible for the perioperative phase. Key elements of the orthogeriatric intervention were a comprehensive geriatric assessment (CGA), coordinated interdisciplinary cooperation, a structured care pathway with checklists and standard protocols, early mobilization, and early discharge planning. Both studies included patients with a hip fracture as a result of a low-energy trauma.

The Trondheim study included home-dwelling persons aged more than 70 years and had focus on mobility, function in daily life, and resource use [15]. The main outcomes of the study showed that the orthogeriatric group had better mobility, function in daily life, and quality of life and had less fear of falling after 4 and 12 months than patients receiving conventional orthopedic treatment. The mean length of stay in hospital was longer in the orthogeriatric group, but the patients had fewer total days in hospital during the first year after the fracture. In addition, there was significantly reduced usage of institutional stays, especially in nursing homes. It was concluded that orthogeriatric treatment was cost-effective [14].

The Oslo study included all hip fracture patients including patients admitted from nursing homes. The main objective of this study was to investigate whether an orthogeriatric model could prevent delirium and accelerated cognitive impairment [16]. No effect of orthogeriatric treatment was shown on the occurrence of cognitive impairment and delirium, but in home-dwelling patients, the study found the same benefit in terms of mobility as in that of the Trondheim study.

Overall, these Norwegian studies provided new knowledge of care for hip fracture patients. Evidence for the benefit of orthogeriatric care for home-dwelling older patients by improvement of mobility and daily life functioning at least one year after the fracture was clearly demonstrated [13–23].

Models of care

Fast track

Several orthopedic departments have recently organized care pathways for patients with hip fractures to achieve priority for surgery and accelerated progress – so-called “fast track” [24]. Such a pathway has many good features such as reduced preoperative waiting time, improved analgesia, faster mobilization, and increased cost-effectiveness. However, these models are supplements to orthogeriatric care but cannot replace such care because of the hip fracture patient's pronounced comorbidity, polypharmacy, and medical and geriatric complications. Fast track models have not shown improvement on final clinical outcomes in treatment trials [25].

Orthogeriatric models

Orthogeriatric treatment models have been set up differently, and the models differ in several ways [26–28]. Some models involve geriatricians early after the hip fracture, while other models involve only in the rehabilitation phase. The amount of “input” of geriatric skills also varies. In some models, geriatricians are involved ad hoc in need for assistance, assessed by orthopedic surgeons, while others have established models in which geriatricians and orthopedic surgeons share responsibility for patient treatment. The input of geriatricians varies: from involvement by only the geriatricians to models with collaboration in interdisciplinary treatment teams.

A recent meta-analysis concludes that interdisciplinary team approaches and involvement of a geriatrician reduce both short-term and long-term mortality, as well as the length of institutional stay [28]. However, systematic reviews and meta-analyses have failed to provide sufficient evidence for a single “model of choice.” Still, a trend is found that a close integration of orthopedic and geriatric expertise around defined beds is promising, while a geriatric team just providing advice on patients spread in an orthopedic ward has no proven benefit.

Different models for organizing orthogeriatric care[27]

I. The patient is admitted to an integrated unit with shared care. Specialists in orthopedics and geriatrics as well as all members of the interdisclipinary team are employed in the same unit and have shared responsibility.
II. The patient is admitted to an orthopedic ward and specialists in orthopedic surgery have overall responsibility throughout the hospital stay.
    a. Specialists in geriatrics and orthopedics have defined work areas with their own professional responsibility throughout the admission.
    b. Specialist in orthopedics has overall professional responsibility while specialists in geriatrics are responsible for routine assessment of all patients.
III. The patient is admitted to a geriatric ward and specialists in geriatric medicine have overall operational and professional responsibility throughout the hospital stay.
    a. Specialists in geriatrics and orthopedics have defined work areas with their own professional responsibility throughout the admission.
    b. Specialist in geriatrics has overall professional responsibility while specialists in orthopedics routinely are seeing all patients post-operatively.
IV. The patient is first admitted to an orthopedic ward where specialists in orthopedics have both operational and overall professional responsibility. Postoperatively, the patient is transferred to a geriatric ward, where specialists in geriatrics take over both operational and overall professional responsibility. Specialists in orthopedics follow up the surgical treatment and complications to it.

In all models, there should be a specified setup for collaboration and involvement of anesthesia service for pre-operative care, in terms of analgesia, anesthesia, and surveillance of patient physiology.

Required professional competence

1. An orthogeriatric unit has permanently associated geriatricians and orthopedic surgeons. Anesthesiologists should be readily available also beyond the perioperative anesthesia.
2. In addition, an interdisciplinary team is required with the following health professions and specialist skills:
    a. Nurses and nurse assistants, physiotherapists, and occupational therapists. It is also desirable to have affiliated nutritionists and clinical pharmacists.
    b. These professions should also have special competence in geriatrics and orthopedics.

Interdisciplinary collaboration

In an orthogeriatric unit, interdisciplinary teamwork is essential [18,29,30]. The team should follow the patient through the entire care pathway and perform comprehensive assessment where the condition before the fracture and that during the hospital stay provides the basis for setting short-term and long-term goals. The interdisciplinary assessment should include somatic health, mental health, cognitive function, assessment of resting and provoked pain, physical function including assessment of gait, basic activities of daily living (ADL), and activities that characterize an independent life (I-ADL = instrumental ADL), as well as the social situation. The team should be able to set realistic goals for the hospital stay on the first postoperative day and start early discharge planning. This should be done in collaboration with the patients, relatives, and municipal health services. Standardized assessment tools are recommended, for example, for the assessment of pain, delirium, mobility, and function. In addition, checklists are often useful.

Organization

Interdisciplinary collaboration should be organized so that each group of professionals has dedicated responsibilities and defined tasks [18]. An interdisciplinary team should have regular and

structured meetings about individual patients, ideally with the use of checklists. To maintain sound professional quality, it is necessary that each unit has procedures and guidelines for medical treatment. Interdisciplinary collaboration should also take place informally between the set meetings.

Roles and tasks

Nurses will have a key role throughout the patient's care. Their tasks range from general care, nursing observations, defined assessments, and communication with relatives and the representatives of the health care system outside hospitals, especially during discharge planning. In addition, the nurses have responsibility for the preparation of the patient for surgery, early mobilization, and rehabilitation [30,31].

Distribution of tasks between geriatricians, orthopedic surgeons, and residents in the two specialties will depend on the established model, i.e., whether the unit is organized as an orthopedic or geriatric ward and whether geriatricians only have an associated function or the total responsibility in the unit. It will also depend on how many residents are available. Ward rounds are organized based on local needs and opportunities.

Specialist in orthopedics should be involved throughout the care pathway, with main responsibilities of fracture diagnosis and surgical treatment, follow-up of surgery and surgical complications, and any surgical follow-up appointment.

A specialist in geriatrics should be involved throughout the process from admission to discharge. The primary task of the geriatrician is to ensure that the patient receives a preoperative and postoperative comprehensive assessment including the treatment of geriatric and medical comorbidities and complications. The geriatrician is also in charge of the medication review and planning of further investigations that are indicated after discharge from hospital, also regarding secondary prevention (fall and osteoporosis assessment).

The anesthesiologist is essential in the pre-, peri-, and early postoperative phases with defined tasks related to pain management, preparation for surgery, perioperative anesthesia, and control of perioperative vital functions and pathophysiology.

The physiotherapist is responsible for facilitating and supervising mobilization and exercise in close collaboration with nursing staff, geriatricians, and orthopedic surgeons [31,32]. The first assessment should be made early in the postoperative phase. A physiotherapist has a key role in functional assessment, assessment of rehabilitation potential, and discharge planning throughout the course.

The occupational therapist focuses on assessment of function before the fracture. Information about pre-fracture function should be obtained, including cognition, social situation, and housing conditions. The occupational therapist is responsible for the adaptation of aids together with nursing staff and physiotherapists and for discharge planning, especially for patients traveling directly home.

The organization of teamwork and the individual's role in interdisciplinary teams depends on the available competence, chosen orthogeriatric model, and local organization in general. Good teamwork is dependent on management of meetings, well-defined tasks, roles and agreement on individual objectives for hospital stay. Patients and relatives should be involved in setting goals and how to reach them. All planned measures after discharge must be feasible with reasonable use of resources and agreed upon with the community health services. All professional groups are responsible for documentation of all relevant information in electronic patient records. Information in external reporting documents must be agreed upon. Discharge summaries should be quality assured by a specialist in geriatrics or orthopedic surgery before the patient leaves the hospital.

Staffing

Hip fracture patients are a demanding patient group for nurses because they undergo surgery, have high care needs, and are often delirious, and early mobilization is essential for a successful outcome. Therefore, a strengthened nursing workforce, approximately 1.5–2 nurse-years per bed is required. In addition, one leading nurse specialist is recommended for every 10 beds to ensure up-to-date professional procedures. Two physiotherapists are required for 10–15 beds and 1–2 occupational therapists for 15 beds. Medical doctor staffing will depend on the local organization, including how many orthopedic surgeons and residents in specialization who contribute to ward activities. A survey from England concluded that one geriatrician per 5 beds is appropriate [33], but

this will obviously vary based on other available medical staff. A clinical pharmacist and a nutritionist are also beneficial. Some departments have a discharge coordinator to help the team with discharge planning.

Ward design and facilities

The ward should be designed to stimulate mobilization. As patients with hip fracture are older and with frequent cognitive impairment and high fall risk, the environment should be designed to prevent delirium and falls. Sufficient access to walking aids is essential, and chairs must be comfortable for older hip fracture patients. Patients should be stimulated to use their own clothes and good shoes. Common dining rooms contribute to increased mobility, social stimulation, and training in the meal situation. Storage of equipment in corridors should be avoided and natural "walkways" that stimulate patients for self-training should be arranged.

The ward should be designed for easy orientation to help patients with dementia and cognitive impairment as well as weakness and dizziness. There must be good lighting and it must be easy to find alarms, watches, calendars, radio, TV, and newspapers. In addition, patients should be encouraged to wear their own glasses and hearing aids, and a voice amplifier should be available.

Moving patients from one room to another when they have first arrived should be avoided, as well as too many different persons involved with the individual patient throughout their stay.

Admission in hospital

The patients usually arrive in the Emergency Room (ER). Some hospitals have "fast track," where patients go directly to the orthogeriatric ward, usually through the radiology department for X-ray [24]. Patients should be checked for injuries other than the hip fracture. Conditions that caused the fall and the fracture, as well as other serious comorbid conditions such as serious infections, stroke, and cardiac events must be taken care of. The patient should therefore be triaged and systematically assessed soon after arrival with a standardized admission record.

The following information should be included:

- Where did the patient have their accident (leisure activity, home, care home, or nursing home)?
- Functional level in daily life activities until the incident, need for help, and need for aids. Ask relatives if they are present.
- The causes and circumstances leading to the fall and subsequent fracture in as much detail as possible.

The following should be assessed:

- If the patient has other injuries, such as a head injury and other fractures.
- Signs of other relevant conditions such as stroke, infection, anemia, cardiac disease inclusive of arrhythmia or heart failure, respiratory failure, dehydration, malnutrition, concomitant drugs, and drug and alcohol overuse.
- Consciousness (Glasgow Coma Scale), attention, and orientation; are there signs of delirium [4]? The 4AT can be used as a delirium screening tool [34].

Radiological examinations

For diagnosing a hip fracture, X-ray is requested. Clinical findings determine whether other radiological examinations should be performed, also later during the hospital stay. Chest X-ray is taken in people with known thoracic trauma, heart failure, or respiratory symptoms. There should be liberal indication for brain CT scanning if brain injury or stroke is suspected.

Blood analyses, urine analyses, and ECG

Clinical assessment determines whether further blood tests should be taken, in addition to a wide panel of routine blood analyses (hematology, CRP, kidney function, liver function, electrolytes, thyroid function, vitamin D, B12, and folate). Repeated analyses of electrolytes should be performed in malnourished patients because of the risk of refeeding syndrome with subsequent electrolyte disturbances. HbA1c should be analyzed in diabetics and pro-BNP in patients with suspected heart failure. INR is required in warfarin users and troponin if acute coronary syndrome is suspected.

Urine dipstick test should be performed on all patients and urine cultured if evidence for infection. Urine from a catheter that is preoperatively inserted can be used.

ECG should be taken at admission.

Preoperative assessment

Emergency medical issues, in addition to the fracture, must be considered without delay by the physician on duty and contact made with relevant and available specialists for further management.

An anesthesiologist should always be contacted shortly after admission for preoperative assessment and assistance with pain relief, including nerve blockade; as well as assessment and stabilization of vital functions, if needed.

A geriatrician should preferably evaluate the patient preoperatively, but surgery should not be postponed if a geriatrician is not available. Internal medicine physicians, anesthesiologist, or other relevant specialists should be called for if acute medical conditions or serious comorbidity needs an evaluation before the surgery.

Early surgery (within 1–2 days) and mobilization have been shown to reduce mortality in patients with hip fracture [35,36]. In Norway, the national quality indicator suggests surgery within 48 h, while NICE guidelines suggest 36 h [1]. Because surgery of hip fractures will relieve pain and reduce ongoing blood loss, it is usually not good practice to postpone surgery for full optimization of physiology. However, severe or unstable conditions associated with severe infections (sepsis) and circulatory or respiratory failure must be addressed preoperatively. Individual decisions should be made based on the use of time spent preoperatively for potentially reducing risks versus poorer surgical outcome prognosis by waiting with surgery. It should be kept in mind that waiting time before surgery should be used effectively to make the patient's situation as optimal as possible.

Pain management

Pain assessment

As many patients with hip fracture suffer from dementia and up to 50% from delirium; pain evaluation must be adapted to patients with cognitive impairment.

Traditional instruments such as the Numeric Rating Scale (NRS) with scores 0–10 may be used if applicable but is not suitable for most of these patients. Therefore, we suggest using Verbal Rating Scale (VRS) with scores from 0 to 4, where 0 indicates that the patient is painless, 1 = mild pain, 2 = moderate pain, 3 = strong pain, and 4 = worst possible pain [37].

Everyone who observes, cares for, or mobilizes the patient should perform a pain evaluation both at rest and just after mobilization by asking how severe pain the patient has. Most people with cognitive failure will also be able to provide a reliable response. At rest, the patient should be painless or have only mild pain, while in the case of mobilization, one must often accept mild or moderate pain as consistent with satisfactory pain management. In patients who are severely cognitively impaired or lack speech ability, signs such as rapid respiratory rate, restlessness, increased delirium, resistance to posture change, facial expressions, and crying could be symptoms of pain. The staff should receive training in such an assessment.

Pain treatment

The goal is to provide sufficient pain relief from as soon as possible after the fracture and until rehabilitation is finished. This also includes a plan for pain management that should follow the patient at discharge from hospital.

At admission, the main principle is to give paracetamol and a nerve blockade as basic pain treatment, supplemented with opioids if necessary. The dose of opioids is titrated in relation to pain intensity at rest. Although the entire hip joint cannot be covered by the blockade, the fascia iliaca compartment (FIC) blockade has been shown to reduce opioid use and may therefore be beneficial. Epidural and lumbar plexus blockade will have better analgetic effect on the entire hip joint but are more technically demanding, and the patient's coagulation status must be checked and adequate.

Depending on how well the nerve blockade is located, the type of fracture, and how much opioid the patient has received before the blockade is established, some patients may experience respiratory depression after the blockade. The patient should therefore be monitored for at least 20–30 min after the injection.

Good preoperative pain relief can probably improve postoperative pain relief. Regional analgesia (blockade or epidural analgesia) may also be a supplement in postoperative pain management. The need for parenteral analgetic administration is usually minimal beyond the first postoperative day, and oral drugs are preferred. In general, simple fixation of neck of femur fractures is less painful than an arthroplasty, whereas fixation of per- and subtrochanteric fractures is the most painful. Loose (non-fixed) bone fragments may also require longer pain treatment.

Analgetics

Paracetamol. The basic analgetic is paracetamol. Regular dosage is preferable initially (oral if possible, otherwise i.v.) if there are no contraindications. Prolonged use of paracetamol may lead to liver injury, and the drug should be used with caution in liver failure. Use for more than 14 days should be with reduced doses.

Dose suggestions

- Paracetamol 1 g x 4 p.o./i.v. at bodyweight above 60 kg, first dose 2 g. The dose must be reduced if use is extended beyond 7–14 days.
- Paracetamol or 1 g x 3 p.o./i.v. at bodyweight less than 60 kg, first dose 1.5 g.
- Further dose reduction is considered at high age (>80 years) or very low body weight.

Opioids. Preoperatively, it is recommended to give nerve block in severe pain. This is to reduce opioid use, and side effects from opioids. However, in addition, the patient may need opioids in depot formulation, as well as fast release.

Morphine should be given with caution in renal failure. Oxycodone may be an alternative. Side effects of opioids are frequent, which include respiratory depression, delirium, urinary retention, nausea, fall tendency, and constipation. Therefore, the lowest effective dose should be given. In case of unacceptable side effects, consideration should be given to switch opioid, as the adverse reaction profile may differ for different drugs. With severe side effects or overdose, naloxone may be considered in carefully titrated doses.

Tramadol should be avoided but can possibly be given with caution in titrated doses.

NSAID. NSAIDs are potent analgesics, but because of their side effects, they are not recommended as standard treatment in this patient group [38], mainly due to risk of renal failure in patients with reduced kidney function, hypovolemia, bleeding, and/or heart failure. Use of traditional NSAIDs or cox-

II inhibitors can be considered as an alternative when pain relief is difficult to obtain and other analgetics are less tolerated.

Steroids. A study of dexamethasone given perioperatively as a single dose (8–16 mg IV, possibly 10–20 mg orally, effect lasting 1–2 days) has recently shown promising results on pain relief and nausea postoperatively [39], but currently, it has no routine place in the treatment.

Gabapentin. Gabapentin has no routine place in the treatment of acute pain in orthopedic patients because of the risk of dizziness and drowsiness.

Peripheral nerve block

In hip fracture patients, blocks are primarily used for pain relief preoperatively. Depending on the hip joint dermatomes, myotomes, and osteotomes, it is to be expected that a single block will not provide full analgesia. Lumbar plexus block, possibly combined with sciatic nerve block with gluteal access, provides the best coverage, but this is an advanced and demanding block. Thus, the femoral or fascia iliaca compartment (FIC) block is recommended preoperatively.

If the patient needs to have a block postoperatively, femoral nerve blockade is not appropriate in patients who have received a hemi- or total hip prosthesis. If a block is needed in those patients, epidural block or lumbar plexus block, possibly combined with sciatic nerve blockade may be used.

Anesthesia

There is no unambiguous evidence that favors a form of anesthesia over another in terms of mortality and serious complications. It has been shown that spinal and epidural anesthesia (without simultaneous deep sedation) may cause less delirium, better immediate postoperative pain relief, and reduced need for opioids (and thus, less nausea and sedation). However, the main findings in the literature are that there is no difference in perioperative or postoperative procedures [40]. The routine method will therefore usually be spinal anesthesia, but general anesthesia is nevertheless a safe alternative. There are no contradictions to general anesthesia if this is desired from a patient or surgeon, or there are contraindications for anesthesia needles in the back (risk of bleeding, anticoagulants, previous back surgery, or local pathology) [41].

Antithrombotic treatment

Many hip fracture patients are using regular antithrombotic medication such as antiplatelet drugs, warfarin, and direct-acting oral anticoagulants (DOACs). All these drugs will increase risk of perioperative bleeding at the fracture site, but an even greater concern is bleeding related to spinal anesthesia, which can cause spinal injury. A recent study showed that perioperative bleeding and 30-day mortality were not increased by use of DOAC without delay in surgery [42]. However, it is recommended to stop DOACs at admission and wait for 24–48 h after the last dose has been taken before spinal anesthesia can be given. Before spinal anesthesia, INR is recommended to be < 1.8 in warfarin users and warfarin-effect can be reversed by giving vitamin K and fresh frozen plasma. The use of aspirin and dipyridamole is considered safe for spinal anesthesia, while if the patient is using clopidogrel, ticagrelor, or prasugrel, spinal anesthesia should be avoided. The benefits of early surgery dictates that prolonged waiting to reduce the effect of the antithrombotic medication should be avoided. General anesthesia is almost always possible.

Surgical treatment

Patients with hip fractures are suitable for standardized procedures. Everyone should have thrombosis prophylaxis and infection prophylaxis according to national guidelines. There is a relatively high risk of medical and surgical complications, worsening of other conditions and diseases, loss of self-reliance, and death. The following principles apply:

Neck of femur fractures

Undisplaced fractures are operated with parallel screws or arthroplasty [43]. Displaced fractures should be operated with an arthroplasty [44]. Direct lateral approach reduces the risk of dislocation and hence is recommended [45]. Arthroplasty surgery for femoral neck fractures should be performed by two surgeons, at least one of whom has experience in hip fractures. Most of the patients should be operated during the daytime. Hemiarthroplasty is recommended for most patients, with a modern cemented stem [46]. The use of a cemented implant will reduce the risk of complications, especially fractures around the prosthesis that can occur both perioperatively and throughout the patient's lifespan [47]. Cementing requires good collaboration between orthopedics and anesthesia to avoid complications related to the cementation. With attention around this, cement-related complications will be reduced to a barely measurable level [48]. A bipolar hemiarthroplasty reduces wear of the acetabulum compared to a unipolar hemiarthroplasty, but a clinical advantage has yet to be unequivocally demonstrated [49]. Total hip arthroplasty is considered for relatively fit patients with femoral neck fractures. With proper patient selection, a total hip arthroplasty will provide improved function without increased risk of complications [46]. Home dwelling, independent, and cognitively intact patients who are expected to continue living at home are candidates for this treatment. It is a more demanding procedure, and patients should be operated by a specially qualified surgeon to reduce the risk of complications. A modern cemented arthroplasty with a large head should be used to minimize complications. Palliation with closed reduction and internal fixation can be considered for patients who are unable to walk before fracture and for the sickest patients (ASA grade V); non-cemented hemiarthroplasty may be considered for the oldest patients with ASA grade IV, when the risk of "cement death" is unacceptably high and more than outweighs the risk of periprosthetic fractures. Primary resection arthroplasty has no place in the treatment of femoral neck fractures.

Pertrochanteric and subtrochanteric fractures

Different guidelines and reviews vary slightly between implant recommendations, but the common pattern is that the most stable fractures may be operated with a sliding hip screw, and with decreasing stability, the recommendation to use an intramedullary nail becomes stronger [1,50,51].

Two-fragment fractures (AO/OTA 31 A1) should be operated with a sliding hip screw. Three-fragment fractures (AO/OTA 31 A2) should be operated with a sliding hip screw or an intramedullary nail. When using a sliding hip screw, a trochanteric stabilizing plate (TSP) may be used to increase stability [52]. Unstable fractures (AO/OTA 31 A3) are preferably operated with a long intramedullary nail. Reports on failure rates seem to favor a nail over a sliding hip screw in unstable fractures, but this is not seen in all studies. The surgeon's preference and technical skills may be as important as the choice of implant; hence, a sliding hip screw (with TSP) may also be used by some surgeons. Subtrochanteric fractures should be operated with a long nail. A reconstruction type nail should be used if the fracture pattern does not allow conventional locking. Unstable per- and subtrochanteric fractures are technically difficult to operate and should be operated by two surgeons, at least one experienced.

Observations

Hip fractures are medical emergencies that require close monitoring and clinical observation by nursing staff and physicians, both in pre- and postoperative phase. Patients may have intercurrent diseases that have caused the fall, such as infections or a stroke, as well as complications to the fall and fracture. Routine scoring tools such as NEWS or MEWS can be used for systematic registration of vital functions at least four times per day preoperatively, or more often if the condition indicates this. Postoperatively, the registration of vital functions should be made at least twice a day, more often if the condition indicates this.

NEWS and MEWS have clear criteria for frequency of measurements and when a doctor is required [53]. Monitoring with pulse oximetry may also be useful in some patients. Systematic evaluation of

delirium and cognitive impairment is recommended and can be made by screening with 4AT both before and after surgery [34]. In addition, the following are to be observed:

Fluid Balance

Oral fluid intake may be reduced for several reasons, including nausea. The fluid balance is followed until the bladder catheter is removed, usually early first postoperative day. Individual assessment of fluid intake should continue for the first few days.

Elimination

Constipation is common in geriatric patients, and many will have constipation at the time of admission. In addition, constipation occurs in almost everybody with opioid use. Therefore, prophylactic laxatives must be given. Frequency of defecation must therefore be followed and documented.

Urinary retention is very common and may be related to opioid use and constipation. Urinary incontinence medication should be stopped until the patient is adequately mobilized. Observation of residual urine with repeated bladder scanning after removal of the bladder catheter should be routine practice. For urinary retention, repeated single catheterization is recommended in most cases.

Wounds and bandages

The dressings are inspected daily and should usually stay for at least 48 h without being exchanged. In case of bleeding or signs of infection, the bandage must be removed and the wound inspected. The wound should nevertheless be inspected before discharge from the hospital. Written information should be provided to the patient and carers about wound care, including information to contact a doctor immediately if secretion from the wound occurs beyond 10–12 days, as this may indicate signs of infection.

Orthostatism and arrhythmia

Blood pressure should be checked for orthostatism in all patients and preferably as soon as the patient is able to stand for 3 min. The measurements can be repeated at the end of the stay. In patients with orthostatism, the drug list should be reviewed for possible culprit medications, but dehydration and hypovolemia should also be considered and corrected. In the event of suspected arrhythmias as a cause of a fall, patients should receive telemetry monitoring, or Holter registration.

Nausea

In case of increased risk of postoperative nausea (risk factors: female, nonsmoker, opioid need, prior travel sickness, or postoperative nausea), nausea prophylaxis with ondansetron (4 mg i.v.), dexamethasone (4–8 mg), and possibly droperidol (1.25 mg i.v.) should be considered.

Medication review

Medication reconciliation

Before a medication review can be performed, a correct overview of the patient's medication is crucial, and reconciliation of all relevant sources of information about medication should be done as soon as possible after admission. The correct list of medication should be available before the introduction of anesthesia and surgery. One must ensure that nonprescription medications, as well as natural preparations and health supplements, are included. This can be done by obtaining information from the patients and relatives, the core journal, the prescription agent, the home care services, the nursing home, the general practitioner (GP), or the pharmacist. If possible, medication reconciliation

can be done by a clinical pharmacist. An updated list of medications with reasons for any changes should be included in the discharge summary.

Medication review (Indication–effect–adverse reaction)

Overtreatment OF drugs occurs frequently. Any medication on the medicine list should be evaluated for adequate indication of further use by a physician. It is not necessary that any change should occur while the patient is hospitalized, but advice may follow in the discharge summary to the GP. Overall regime should be considered in terms of estimated usefulness, general health, and frailty and, in some cases, prognosis in relation to survival. Undertreatment of conditions is also common, i.e., osteoporosis, so that whether the patient is receiving adequate treatment for all relevant conditions should also be assessed.

Important points to address:

- The drug list should always be assessed in relation to fall risk. This is usually due to low blood pressure, orthostatism, or drugs that affect cerebral function. Orthostatism is common in geriatric patients and diagnosed by history and blood pressure measurement. Many drugs including blood pressure medications, alpha blockers for prostate hyperplasia, and opiates can cause this. Orthostatic measurement should also be performed after completion of rehabilitation.
- Assess the need for osteoporosis treatment.
- Drugs with anticholinergic effect increase the risk of delirium and discontinuation should be considered, preferably before surgery.
- Drugs with sedative properties (benzodiazepines, opioids including tramadol, hypnotics, and gabapentinoids) should be limited as much as possible and used at the lowest possible dose due to the risk of delirium, falls, and sedation, which inhibit mobilization.
- Drugs against urinary incontinence should be stopped before surgery and not reintroduced before the patient is well mobilized and does not have urinary retention.

There are several tools that may be useful in the decision-making process when prescribing medication in older patients with hip fracture. Interaction may be assessed by using interaction databases. START and STOP criteria include list of drugs that should or should not be used by older people [54]. STOPPFrail is a special version of the criteria intended for pharmacotherapy in frail older people with limited life expectancy [55].

Nutrition

A significant proportion of patients with hip fracture (20–50%) [56] is in a poor nutritional state; many are underweight and have reduced muscle mass and function. There is also increased risk of undernutrition because of preoperative fasting and reduced appetite in the postoperative period. The measures should therefore begin preoperatively. All patients should be screened for malnutrition and risk of malnutrition with measurement of bodyweight, height, calculated body mass index (BMI), and information of weight loss and reduced nutrient intake. NRS2002 is a recommended method [57].

- Evaluation of swallowing should be done, as dysphagia is common and often overlooked in older patients.
- Preoperative fasting should be limited as much as possible. In patients with adequate gastric passage and bowel function (reduced by dehydration, severe pain, and opioid use) and expected to wait more than 4–6 h of surgery, use of preoperative nutritional beverages may be considered. Nutritional drinks that are particularly developed for use preoperatively up to 2 h before surgery are available.
- As a general routine, all patients should be served especially protein and energy-rich meals and be offered extra meals, preferably in the form of nutrition drinks or snacks.

- Good oral and dental hygiene must be ensured through good nursing, as it is important both for nutritional intake and for the prevention of pneumonia. A nurse or a physician should inspect the oral cavity early during the hospital stay.
- Those who are screened to be at nutritional risk or have malnutrition should receive nutritional assessment and be treated according to an individual nutritional plan. All departments should have guidelines for this, and individual nutrition plans are best prepared in collaboration with dieticians.
- Older patients with hip fracture in hospital should be closely followed up and assisted during the meals, preferably by a dedicated nutrition assistant.

Special postoperative issues

Load stability and mobilization

Osteosyntheses and prostheses are load-stable immediately postoperatively, and the patient should be mobilized without restrictions. Early and full mobilization is the rule; in case of exception, this should be well documented. Early mobilization, preferably already the day of surgery, and guided by a physiotherapist, is sought; see physiotherapy attachment.

Infections

The most common infections are wound infection, pneumonia, and urinary tract infection (UTI), while other medical infections are rare. Delirium can be the first symptom of an infection. The CRP can increase to more than 200 due to the hip surgery per se, and higher values or increasing values may be a sign of infection. The use of screws alone, however, gives a more modest CRP increase. Typically, CRP decreases from day 3, while leukocytes are normalized earlier. Procalcitonin may be helpful in the assessment of infection. Some patients have symptoms and findings consistent with an infection already preoperatively. Then it is important to start antibiotics before surgery. Choice of antibiotics must follow national and local guidelines.

Wound infection

Any sign of postoperative infection in the operated area should be evaluated by an orthopedic surgeon. Early diagnostics and treatment are essential for a good result. In all surgical wounds where the suture line is not dry after 2 weeks, infection should be suspected. CRP and leukocytes may be low. Surface bacterial samples from the wound have no place in the diagnostics. No antibiotics should be given before collecting the test material from the wound at depth. Treatment is almost always operative: Reoperation with a thorough debridement, rinsing with 5- to 10-L saline, and replacement of replaceable prosthetic. Empirical antibiotic treatment starts preoperatively after sampling, according to national guidelines. After reoperation, treatment is almost always intravenous antibiotics for 2 weeks followed by oral treatment for 6–12 weeks depending on the type of infection and implant. Primary treatment with antibiotics alone without surgery or with prolonged low-dose antibiotics may be relevant to the frailest patients.

Pneumonia and urinary tract infection

Pneumonia often occurs at day 2 or 3 and is characterized by continuous increase in CRP beyond day 3. Most often, but not always, leukocytosis is seen. The patient with pneumonia usually has respiratory symptoms such as cough and fast respiratory rate, but infiltration is not always seen on chest X-ray. Urinary tract infections (UTI) should preferably be diagnosed by detection of bacteria and leucocytes in a urine sample. The patient is often asymptomatic regarding typical UTI symptoms (pain, urgency) but may have urinary retention and delirium, and in some cases, the UTI can be the main cause of falling. Some patients have irritation in the urethral opening after the bladder catheter, which can be misinterpreted as UTI, and many older women have asymptomatic bacteriuria, which should not be treated with antibiotics.

Prevention and management of delirium

Up to half of all patients with hip fractures will experience delirium during hospitalization [3], and it is recommended to systematically screen all patients with a screening tool, such as the 4AT (http://www.the4at.com) [34]. In preoperative delirium, it is important to optimize pain relief and to ensure basic functions focusing on respiration, circulation, hydration, and elimination. Avoid unnecessary waiting time for surgery and transfer between different units. Patient comfort and feeling of safety, as well as measures for good sleep at night and close person contact with reorientation, is important. Family members may participate to make the patient safe and comfortable. Pay attention to impaired vision and hearing; let the patient have their own glasses and hearing aids; if needed, use a voice amplifier.

If the patient has established delirium and is hyperactive and agitated, drug treatment may be necessary to handle the situation and be able to perform diagnostics and treatment. There is no indication for prophylactic pharmacological treatment of delirium.

After surgery, the same factors and measures are important [58]. Continue to pay attention to elimination (remember bladder scanning), nutrition, pain, and postoperative medical complications, possibly unrest due to bladder catheters. Patients who develop delirium late in the process, i.e., after the first postoperative day, must be assessed for medical complications. The most common complications are infection with or without respiratory or circulatory symptoms and worsening of underlying cardiac or pulmonary diseases.

In hyperactive delirium with restlessness, agitation, and hallucinations, collaboration with the patient can be difficult and important treatment denied. This increases the risk of complications and poor outcomes and may be an indication for pharmacological treatment. At the same time, necessary observation of natural functions and fall prevention should have priority. Hypoactive delirium is not an indication for pharmacological treatment, but the condition is important to recognize and treat as delirium in general.

Symptomatic pharmacological treatment of delirium[59]

Antipsychotics

- Haloperidol 0.5 mg (1) –2 mg x 2 oral or intramuscular (i.m.) injection, especially indicated for psychotic symptoms. Use low starting dose and give maximum daily dose of 5 mg. Use lower doses for frail patients and patients with dementia.
- In the absence of efficacy after 2–4 doses, olanzapine may be tried, given as 2.5–10 mg oral or i.m. in the evening.
- In Parkinson's disease, Lewy body disease, and other disorders with Parkinsonism, antipsychotics are relatively contraindicated, but a few patients may still need medication. Quetiapine is then the drug of choice, with daily dose of 50–100 mg oral, divided into 2 doses (starting dose 25 mg).
- NB! The treatment should be carried out only for a limited period, usually only few days.

Benzodiazepines

- Preferably avoid these drugs, except with significant anxiety. Preferred preparation is oxazepam given orally. In special situations, diazepam may be given intravenously (i.v.) or midazolam i.v. or subcutaneously (s.c.), with close observation of respiration and circulation.
- Benzodiazepines should not be discontinued in patients with long-term regular use. Discontinuation may cause withdrawal symptoms that exacerbate the delirium.
- Avoid regular sleep medicine if the patient is not using it regularly. The exception is melatonin preparations that may have a certain effect. Otherwise, a short-acting Z preparation is advised.

If the patient is medically unstable with treatment-resistant delirium, sedation on an intensive care unit (ICU) with dexmedetomidine may be considered.

Prevention and management of pressure ulcers

Older patients with hip fractures are prone to pressure ulcers. They may have had them before the fall and fracture or received them after lying on a hard surface after the fall or during transport to hospital. Assessment of risk and prevention of pressure ulcers must be done systematically. Prevention should start already during transport to hospital.

Pressure ulcers usually occur on prominent bone structures (sacrum, tuber ischiadicum, trochanter, heels, and lateral malleol) and are due to mechanical stress (pressure, tension, and friction). Immunity, malnutrition, incontinence, neuropathy, and age-related skin changes, including reduced subcutaneous fat and loss of epidermal nerve function, increase the risk.

Systematic assessment of pressure ulcer risk is required for effective prevention and treatment. This is best done by a standardized method (The European Pressure Ulcer Advisory Panel (EPUAP)), even there is no method proved to be superior to others [60].

Pressure relief and prevention of stretch and friction are central in prevention and treatment. Distribution of pressure points with pillows, turning, and special mattresses are important care measures. Wounds should be kept clean and moist, and necrotic tissue must be removed. There is no evidence that one type of dressing is better than another type. In addition to local prevention and wound care, general measures such as improving the overall health, nutritional situation, and mobilization are of major importance.

A good piece of advice is to routinely provide all patients with hip fracture a special pressure-relieving mattress on admission to hospital.

Prevention and treatment of constipation and urinary retention

Chronic constipation is common among older people, and constipation occurs in a majority postoperatively, especially with opioid use. Preventive treatment should therefore be initiated when starting opioid therapy. Oxycodone preparation combined with the opioid antagonist naloxone is considered to give less constipation during prolonged treatment and may be an alternative. If constipation beyond the 2nd postoperative day, further measures must be initiated. Good hydration and mobilization are important nonpharmacological measures. In patients with cognitive impairment, it is imperative that the department has routines to observe when the patients have stools (time, amount, and consistency).

First-line treatment includes osmotically acting agents such as lactulose, which works by absorbing water and increasing fecal volume. It is therefore important that the oral fluid intake is adequate. Other available drugs are bisacodyl, sodium picosulfate, naloxegol, and methylnaltrexone, which is mainly used in palliative care and administered subcutaneously.

To prevent urinary problems, minimize the use of urinary catheters and screen for urinary retention with a bladder scanner. The patient should be helped to the toilet rather than using urinary containers in the bed to ensure good bladder drainage. Bladder catheters can usually be removed in the morning on the 1st postoperative day.

Assessment and prevention of falls

Virtually all patients with hip fractures have fallen. It is therefore very important to assess risk of repeated falling, investigate fall mechanism, and initiate preventive measures to avoid new falls and fractures, both during the current admission and in the future. A department caring for older patients with hip fractures should have routine systematic assessment of fall risk and initiate preventive measures. A basic assessment should be done during the hospital stay. Emphasis must be placed on patient history, with questions such as, What happened when the patient fell? Is there a suspicion of loss of consciousness or syncope? Are there new symptoms (such as stroke, infection, or epilepsy) that may have caused to the fall? Has the patient had previous falls and, if so, how did it happen? The patient should also be asked about fear of falling and motivation for exercise and behavioral adjustments.

Important measures to prevent new falls are as follows:

1: Risk assessment:

All patients with hip fractures have increased risk of falling, in particular patients who have had several falls last year, have delirium or dementia, are visually impaired, need frequent toilet visits, have fainted, use psychoactive drugs, or need walking aids [61].

2: Standard measures for all patients with elevated fall risk:

- Medication review (physician's responsibility)
- Checklist for patient rooms
- "Sitter" when needed (continuous observation)
- Patient and relative information
- Maintain activity and training: Early and safe mobilization

3: Interdisciplinary investigation:

- The medical component includes assessment of general health (general condition, anemia, etc.), orthostatic blood pressure examination, possible syncope assessment, neurological status, and medication review with special attention paid to medications that increase fall risk.
- The nurse assesses vital functions, pain, delirium and cognitive function, ADL, and behavior, possibly together with an occupational therapist who also assesses the need for aids at home.
- The physiotherapist assesses balance and muscle strength, facilitates proper mobilization, and assesses the need for walking aids.

4: Individually adapted measures:

Tailored measures based on the interdisciplinary investigation. All patients benefit from exercise of muscle strength and balance.

5: Transfer of information on risk assessment and measures:

Information should be given to the patient and relatives, home nurse services, general practitioner, physiotherapist and occupational therapist in the municipality, nursing home, or rehabilitation institution.

Patients who have had multiple falls without a clear cause should be investigated further, possibly in a geriatric outpatient clinic (fall clinic) after discharge and fracture healing (3 months).

Medical issues

Cardiovascular disease

Worsening of already established cardiovascular disease is most commonly seen. To assess etiology of dyspnea (heart failure vs. pneumonia, COPD, or asthma), chest X-ray and echocardiography can be helpful. In clinical heart failure, diuretics are recommended only when overhydration is present.

When considering acute coronary syndrome (ACS; unstable angina and myocardial infarction) troponin analyses can be difficult to interpret due to muscle damage and renal failure, and troponin should not be analyzed without suspecting ACS. For diagnosis, symptoms and presence of elevated troponin and ECG with signs of ischemia or infarction should be demonstrated. Treatment of ACS will result in increased postoperative bleeding hazard.

Atrial fibrillation postoperatively is relatively common, especially in patients with known paroxysmal atrial fibrillation. The triggering cause is often hypovolemia, anemia, infection, or hypoxia that must be treated. Avoid discontinuation of beta-blockers during the stay if the patient is using these drugs.

Pulmonary disease

The most important pulmonary problem is the exacerbation of COPD with dyspnea, hypoxia, and often obstructivity. This does not have to be due to an infection but can be triggered by surgery and anesthesia, as well as bed rest, thereby causing stagnation of mucus. COPD is treated according to common guidelines. If the patient is already being treated for chronic lung disease, such medication should be continued.

Thromboembolism

The risk of deep venous thrombosis (DVT) and pulmonary embolism (PE) is significantly reduced using prophylactic low-molecular-weight heparin. It is unclear whether direct-acting oral anticoagulants (DOAC) may have the same preventive effect.

DVT is difficult to detect if it occurs in the operated lower limb. Pulmonary embolism is difficult to distinguish from pneumonia and heart failure. For clinical suspicion, an ultrasound Doppler of the lower limb is performed. If negative, a CT thorax with contrast (pulmonary emboli protocol) is performed.

Blood loss and blood transfusion

Most patients tolerate hemoglobin (Hb) values down to 8 g/dl without the need for transfusion. For patients with cardiac disease or severe impairment of cerebral or pulmonary function, transfusion limit should be increased to 9–10 g/dl. The need for blood transfusion should be evaluated individually. The Hb fall (volume and timescale) is important along with suspected symptoms of anemia such as new dizziness, breathlessness, and fatigue. The benefit of liberal versus restrictive transfusion practices is still being discussed [62–65]. More liberal transfusion policy is recommended preoperatively if blood loss during surgery is expected.

Oxygen treatment

Hypoxia is common after surgical procedures including hip fractures. The problem is greatest during the 1st postoperative day but can last for up to 5 days after surgery. Episodic hypoxia is frequent, especially the first nights. Mobilization of the patient can counteract this. Early hypoxia is related to anesthetic agents and opioid analgetics, but later on, the cause may be immobilization or hypoventilation and apnea periods related to analgesia and sleep disorders. Patients with known heart failure and pulmonary disease are particularly prone, and hypoxia may represent deterioration from habitual state. Hypoxia may increase the risk of delirium and should be treated if possible. It seems reasonable to provide oxygen supplements with a nasal catheter, optionally on a mask, if the saturation is less than 90%. Prophylactic oxygen supplementation in the absence of low saturation values is not recommended, as this may mask signs of hypoventilation.

Osteoporosis assessment and treatment

Generally, all patients with hip fractures after low-energy trauma should be treated for osteoporosis, regardless of bone density and other risk factors [66]. There are different options; per oral bisphosponates, injections with densumab every half year, and zoledronic acid infusjon, which can be given during hospital stay. The Horizon study shows fracture preventive effect and lower mortality of zoledronic acid in the treatment group irrespective of bone density [67]. The treatment is cost-effective and with increasing gain with age. Patients with a short life expectancy are an exception because the drugs need approximately 6 months to exhibit an antifracture effect. The patients often suffer from vitamin D deficiency or borderline low levels, and an initial treatment with higher doses should be considered. Low levels of vitamin D may also be associated with poor fracture healing.

Rehabilitation and discharge planning

All patients with hip fractures should be offered exercise, with a few exceptions such as patients with severe dementia or other serious illness with reduced life expectancy and high care needs where rehabilitation is not possible. The content and intensity of the rehabilitation must be adapted to the prefracture physical and cognitive function as well as to the patient's preferences and motivation. The goal will depend on patient's situation before the fracture but should be discussed in the interdisciplinary team and communicated to the patient, relatives, and those who will care for the patient after the hospital stay.

Access to rehabilitation services will vary not only between countries but also locally. In Norway, hospital stay is short (6–10 days), and rehabilitation is usually offered in municipal rehabilitation

institutions or special units in nursing homes, or within the patient's own home with an interdisciplinary rehabilitation team. For patients who are most fit, it may be appropriate to be discharged directly home with the follow-up of a private or municipal physiotherapist. Long-term residents in nursing home will usually return to the same institution. Specific instructions on further rehabilitation should be given to ensure that these patients are also adapted to training for mobility improvement.

Information to community services

Discharge planning starts already the first day after admission when assessing and obtaining information about the following:

- Social status and housing conditions, family, and other support functions
- General health status and cognitive and mental state
- Previous care needs, walking function, and use of walking aids.
- Past falls and tendency to fall.

Notification must be sent to community care service for information about the probable need for care on discharge from hospital.

Rehabilitation

Assessment starts before surgery, and interdisciplinary rehabilitation starts postoperatively as soon as possible [32,68,69]. When planning discharge, the following factors should be considered:

- Motivation and wishes from patient and family when it comes to exercise.
- Overall medical assessment.
- Walking function and walking aids. Fall risk. Need for personal support.
- Personal ADL in the first few days post-operatively.
- Behavioral disturbances.
- Presence of cognitive impairment and dementia.
- Required time for treatment and expected time for recovery in case of complications.
- Assessment of the home's suitability for the patient to return directly home. Needs and opportunity for using aids. Possible correction of environmental fall risk in the home.
- Prescheduled departure date.

Long-term goals and forecasts must be considered. Rehabilitation generally aims to return to previous function, but unfortunately, this is not achieved for all. Exercise should be performed for several months with the guidance of a physiotherapist.

For patients discharged directly to home, the hospital must ensure that the necessary aids are ready when the patient returns home.

Is the patient ready for discharge?

Length of hospital stay must be considered individually, but these conditions should be in place before the patient can be discharged:

- Sufficient nutrient and fluid intake.
- Elimination is functioning (urine and feces).
- Adequate pain control.
- Stable Hb without evidence of persistent bleeding.
- Training and mobilization have started.
- Improvement of delirium and other medical and orthopedic complications.
- Newly discovered medical conditions or symptoms under control.

- Medication review
- Assessment of falls and fall prevention initiated
- Plan for osteoporosis treatment
- Medication list, need for prescriptions

Practice points: Summary of recommended care pathway for patients with hip fracture

- **Preoperative assessment** of orthopedic surgeon, geriatrician, and anesthesiologist for diagnostics, optimization of pathophysiology, medication assessment, and adequate pain relief.
- **Optimize fracture treatment** and prevention of complications related to surgical treatment.
- **Orthogeriatric assessment and care** (systematic, interdisciplinary, and multidimensional investigation and treatment) focusing on the patient's resources and limitations.
- **Optimize somatic health**
  - o Diagnostics and treatment of fractures and comorbid conditions
  - o Prevention and treatment of complications such as delirium and infection
  - o Systematic review of medications
  - o Screening, prevention and treatment of nutritional failure
  - o Assessment of skin problems (surgical procedure and prevention of pressure ulcers)
  - o Assessment and treatment of pain
  - o Prevention of new fractures – assessment of fall risk and osteoporosis
- **Optimize mental health**
  - o Assessment of cognitive function, prevention, and treatment of delirium
  - o Assessment and treatment of anxiety and depression
- **Function and elimination**
  - o Assessment of ADL, IADL, and mobility before the fracture and during the stay
  - o Screening and treatment for urinary retention
  - o Prevention and treatment of constipation
  - o Improve sensory impairment – hearing aids, glasses, and good light
- **Social conditions**
  - o Assess and improve possibilities to be discharged to own home, possibly directly from the hospital
  - o Assess needs for aids or adjustments in own home
- **Early mobilization** and participation in ADL activities as soon as possible.
  - o Develop individual rehabilitation plans based on clinical condition, function before fracture, and motivation.
- **Discharge planning** starts as early as possible. Define discharge destination, aids, and realistic goals for rehabilitation. Good interaction with patients, relatives, and community health services is essential.

Research agenda

- There is no consensus on what is the best model of care; more research on what are the most important elements and organizational issues are requested.
- To optimize pain treatment, effective and safe methods and medication regimens should be developed and tested.
- Effective programs for prevention and treatment of delirium, should be developed. For this purpose, more research on pathophysiology is needed.
- Bleeding and blood transfusion policy and better knowledge of when it is beneficial for the patients to receive blood transfusions are needed. Further, better methods and programs to prevent bleeding and blood loss are required, particularly in patients using antithrombotic agents.

Summary

Guidelines for interdisciplinary care for patients with hip fracture are developed in Norway and other countries. These guidelines are partly evidence based and partly developed according to clinical experience. Generally, evidence for interdisciplinary orthogeriatric care as presented here is convincing. However, there are still elements of care that need to be better understood and optimized, such as pain treatment, prevention and treatment of delirium, bleeding, and blood transfusion policy.

There is no consensus on what is the best model of care, but probably, the most important is to implement a care pathway that includes the critical care elements and is adapted to the local health services. To implement care models and guidelines into clinical practice is at present probably the greatest challenge, with a need for international and multiprofessional collaboration and action.

Conflicts of interest

The authors declare no conflicts of interests.

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