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The New APGAR SCORE: A Checklist to Enhance Quality of Life in Geriatric Patients with Hip Fracture

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Abstract: For geriatric patients with hip fractures, the broken bone is the reason for admission, but only part of the overall disease. Indeed, it may be more helpful to consider the patient having geriatric hip fracture syndrome or sustaining a hip attack, as there are many associated medical, social, psychological, and other problems to which attention must be paid. To that end, we have identified a series of 10 steps, collected into a checklist, that can be undertaken for all patients with geriatric hip fracture. In homage to the maxim "we come into the world under the brim of the pelvis and go out through the neck of the femur," we defined our checklist by the acronym APGAR SCORE, named after the classic checklist of the same name used to assess a newborn child. The 10 elements include attending to problems of Alimentation and nutrition, Polypharmacy, and Gait; initiating a discussion about Advance care planning; correcting any Reversible cognitive impairment; maximizing Social support; checking for and remediating Cataracts or other impairments of vision; assessing for and addressing Osteoporosis; and last, ensuring that Referrals are made and that the patient has a safe Environment after discharge. For the newborn, the Apgar score has been criticized as an imperfect tool, and likewise the problem of geriatric hip fracture will not be solved with this new Apgar score either. Nonetheless, a score of 10 here,1 point for each item, may help to optimize the outcome for this difficult disease.

Clinical and functional outcomes following geriatric hip fracture have changed little in the past 30 years. Although about one-third of patients return to their pre-injury functional status, the remainder either lose a level of independence or die within the first year after injury[1].

The main focus of attention for geriatric patients with hip fractures has been the hip fracture itself. The broken bone is the reason for admission, but only part of the disease. Indeed, it may be more helpful to consider the patient having geriatric hip fracture syndrome or sustaining a hip attack, as there are many facets of this condition (outside the bone) to which attention must be paid.

Because the outcomes after hip fracture are especially poor for patients admitted from nursing homes[2], Ko and Morrison[3] have suggested that, in this group, geriatric hip fracture should be a trigger for palliative care, defined as the broad consideration

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of the associated medical, social, psychological, and other problems, without abandoning efforts at "disease-directed or curative treatments." We endorse that view, but suggest that this expansive approach may be applicable to all geriatric patients with hip fracture, not just those admitted from nursing homes.

To that end, we have identified a series of 10 steps and have collected them into a checklist that can be undertaken for all geriatric patients with hip fracture. Checklists, popularized by Gawande's bestselling book, *The Checklist Manifesto: How to Get Things Right*[4], have been shown to enhance compliance and completeness, even among experts[5]. The aim of this 10-item checklist is to supplement the efforts directed at treating the fracture and to mitigate the burdens imposed by conditions typically seen with this injury.

In homage to the maxim "we come into the world under the brim of the pelvis and go out through the neck of the femur,"[6] we defined our checklist by the acronym APGAR SCORE[7], named after the classic checklist used to assess the newborn child. We hope that a score of 10 on our new APGAR SCORE, 1 point for each item, will predict an optimal outcome for the patient with a geriatric hip fracture, just as a score of 10 is a positive predictor when applied to the neonate.

Elements of the New APGAR SCORE

A Is for Alimentation and Nutrition

Many patients with hip fracture are malnourished, and this can increase the risk of complications such as impaired wound-healing[8]. Koval et al.[9] found that malnourished patients with hip fracture have longer hospital stays, increased odds of dying, and a decreased likelihood of returning to their pre-injury functional state. Thus, all patients with geriatric hip fracture should be assessed to ensure that they are not nutritionally depleted[10].

The physician caring for a geriatric patient with hip fracture must pay attention to all aspects of alimentation and nutrition to make sure that the correct foods are chosen, that the patient has the ability to chew and swallow, and that there are no social or financial obstacles to consuming an adequate diet.

The typical malnourished patient may present with a body mass index (BMI) of <20 kg/m^2, but laboratory tests might be needed as well to detect protein or vitamin D deficiencies, among others. Frank et al.[11] have proposed using a Malnutrition Universal Screening Tool score to identify patients at risk. This score considers BMI, recent weight loss, and overall disease state. This group has found albumin to be a poor indicator of nutritional status, echoing the finding[12] that the Nutritional Risk Indicator score (based on albumin levels and BMI) was only 43% sensitive for detecting malnutrition.

Steps can be taken to increase nutritional intake, such as providing supplements and small high-calorie snacks, offering food variety, fortifying meals, improving the ambience of eating, and sharing encouragement by caregivers[13].

P Is for Polypharmacy

The typical patient presenting with a geriatric hip fracture is likely to be taking ≥6 medications[14]. Polypharmacy, defined as the inappropriate use of multiple drug regimens[15], is associated with an increased risk of fracture[16]. Some of the medications taken by a patient with hip fracture may be required for health maintenance, but others may be more harmful than helpful. In particular, H2 blockers (e.g., Zantac [ranitidine]), benzodiazepines (e.g., Xanax [alprazolam]), and anticholinergics (e.g., Atrovent [ipratropium bromide] for rhinitis and Ditropan [oxybutynin] for urinary incontinence) can cause delirium. Medications that cause hypotension can also contribute to falls[17].

A routine medication analysis should be undertaken upon hospital admission to determine whether each medicine on the patient's list should be continued through the hospitalization and beyond. In a controlled study[18], having a clinical pharmacist evaluate patients' drug regimens decreased inappropriate prescribing on a sustained basis and led to fewer adverse drug events.

Two related points must be kept in mind. The first is that abruptly discontinuing medications may be poorly tolerated. Thus, tapering, rather than stopping, the medicine may be needed. The second point is that, for a new prescription regimen to be beneficial, the plan must endure; that is, discontinued medication must remain discontinued. Both of these themes unite around the importance of communication with the post-discharge physicians (see Referrals below).

G Is for Gait

A risk for falls is an independent risk factor for geriatric hip fracture[19]. As such, gait is a central concept in the etiology of this condition. Moreover, gait is an important factor dictating treatment selection and prognosis. Gait abnormalities are strong predictors of reinjury[20], lost independence, and mortality[21].

The first consideration with regard to gait is determining the patient's baseline ambulatory status and predicting whether the patient is likely to walk after a surgical procedure. Simply, if the pre-treatment assessment suggests that the patient is not apt to walk even with a perfect surgical procedure, the goals of controlling pain and facilitating nursing care may be met with nonoperative treatment. Note that in America, operative treatment of geriatric hip fracture seems to be the default, perhaps even for patients who are not apt to fully benefit from it, whereas operative treatment is employed more selectively elsewhere around the world. For example, studies from Canada[22] and Singapore[23] showed that more than 11% (5,311 of 50,235) of patients in Canada and 26% (727 of 2,756) of patients in Singapore were treated nonoperatively.

A second consideration is that therapy to improve impaired gait must be a major aim of postoperative rehabilitation. A gait assessment[24], once the patient can bear weight, may reveal generalized weakness that needs to be addressed. Imbalance and dizziness may also contribute to an unstable gait; these can be detected via screening inventories like the Berg

Balance Scale or the Get-Up and Go test[25]. Both home-based and group-based exercise programs can improve physical abilities in the elderly[26].

A Is for Advance Care Planning

Advance care planning is defined[27] as the process of assisting patients "to reflect on their goals…consider future medical treatment preferences…and to document their wishes." This process has been shown to improve end-of-life care and satisfaction; to decrease stress, anxiety, and depression in survivors[27]; and to decrease health-care spending[28]. Despite this benefit, the "lack of a clear threshold or prompting event"[29] to initiate a conversation about advance care planning may lead to inadequate utilization of this approach.

Although the occurrence of a geriatric hip fracture can serve as the prompting event needed to initiate a discussion of management goals and choices[30], evidence suggests that this opportunity may be squandered. Dunn et al.[31] reviewed the charts of 150 geriatric patients with hip fracture to identify documentation of advance care planning and found that only 21 patients (14%) who presented without advance care planning in place had this issue considered when they were hospitalized.

Granted, it may be awkward for the hip fracture team to broach the topic, as acute care providers typically do not have a long-standing relationship with the injured patient. Nonetheless, the knowledge that patients will benefit from these discussions ideally would trump that unease. At the least, the team should recommend to the primary care physician that he or she should have a more detailed conversation with the patient after discharge.

R Is for Reversible Cognitive Impairment

Patients with geriatric hip fracture can present with an apparent cognitive impairment. For many patients, this is dementia[32]. Dementia typically connotes a chronic dysfunction, yet a reversible cognitive impairment can also be found. It is imperative, especially in the realm of informed consent, that the team caring for a geriatric patient not assume that an observed cognitive impairment is the patient's baseline state[33]. Rather, lack of capacity might be reversed with appropriate interventions, and this should not be missed.

One form of altered mental status is delirium[34]. Delirium may affect >50% of geriatric patients with hip fracture[35], before or after an operation. Delirium might be caused by electrolyte abnormalities, medications, sensory alterations, or the physiologic challenge of the injury. Recent advances in screening for delirium might improve care. For example, the 3-Minute Diagnostic Assessment for Confusion Assessment Method-Defined Delirium (3D-CAM) is a brief and validated screening tool[36] that can be implemented without specific training in psychiatry.

Prevention of delirium may be possible for patients with hip fracture through multicomponent interventions[37]. Among patients who experience delirium during hospitalization, treatments include adjusting medications, giving fluids and electrolytes, and normalizing the bedside environment. Among patients for whom non-pharmacologic intervention treatment fails, brief courses of antipsychotics such as haloperidol may be useful, although firm evidence of efficacy is lacking[38]. Likewise, according to a systematic review, the evidence regarding the benefits of neuroimaging modalities to evaluate delirium is not conclusive[39].

Last, it is certainly reasonable, and in many cases advisable, to solicit help from the hospital's psychiatric consultation-liaison service.

S Is for Social Support

Depression is more common in elderly people[40] and those with falls may become even more depressed[41]. Voshaar et al.[42] followed a cohort of 139 elderly patients who did not have depression at baseline and then were hospitalized for hip fracture; within 6 months, 20% developed clinically important depressive symptoms. Further, Givens et al.[43] found that depression was associated with a higher risk of poor outcomes including institutionalization and death. A related problem is fear of falling, an issue for a majority of patients after hip fractures. Fear of falling is associated with loss of mobility, institutionalization, less time spent on exercise, and an increased frequency of falls[44].

Both the Center for Epidemiological Studies-Depression Scale (CES-D) and the Geriatric Depression Scale (GDS) are validated and effective screening tools for elderly patients[45]. The Falls Efficacy Scale-International (FES-I) is a reliable screening tool for measuring fear of falling[46]. Cognitive therapy has been shown to improve depression in older adults, and psychodynamic therapy and physical exercise also lead to lesser but still clinically relevant outcomes[47,48]. Fear of falling was substantially reduced by engaging in tai chi and exercise programs[49].

Ciechanowski et al.[50] found that reducing social isolation may be helpful in decreasing depressive symptoms. A systematic review found that group social activities were effective interventions for preventing and alleviating social isolation[51]. Hence, a social worker's recruitment of the best possible social support system for a geriatric patient with hip fracture is advised. Requesting a formal psychiatric-liaison consultation evaluation to help with depressive symptoms may be indicated as well.

C Is for Cataracts (and Other Impairments of Vision)

The Framingham study[52] found that the rate of hip fracture in people with impaired vision was approximately triple that in those with good vision. Similarly, Squirrell et al.[53] found that 55 (62%) of 89 patients with hip fracture could be classified as visually impaired; Jack et al.[54], examining 200 patients, reported that 76% of those with a history of falls had a visual impairment. Accordingly, patients with falls should be assessed to ensure that poor vision is not responsible for the event.

Vision screening is particularly important, given that it is common to have visual disturbances that are amenable to treatment: 40 of the 55 patients who were deemed to have impaired

vision in the study by Squirrell et al.[53] were found to have a "potentially remedial visual impairment," namely, cataract (23 patients) or an uncorrected refractive error (17 patients). Cataracts can be treated through vision aids or operative treatment, and effective treatments for other common visual diseases, like age-related macular degeneration and glaucoma, exist as well[55].

Squirrell et al. recommended bedside testing (measuring visual acuity, assessing visual fields, and checking for a loss of the "red reflex," the loss of which may indicate a cataract). Not all members of the geriatric hip fracture team may be comfortable doing this. At the least, a referral for a comprehensive ophthalmology examination is indicated in those suspected to have poor vision. Improving vision is likely to help to reduce the risk of a second fall[56]; better still, improving vision is likely to improve a patient's quality of life.

O Is for Osteoporosis

Geriatric hip fracture may have many indirect causes (diseases that cause falls and frailty), but hip fracture is often directly related to osteopenia or osteoporosis. For that reason, the American Orthopaedic Association's Own the Bone[57] initiative advocates bone mineral density testing for all geriatric patients with hip fracture.

Although intuition suggests that, by the time fracture occurs, it is too late to initiate osteoporosis treatment, that is not so. Lyles et al. found that the risk of new fractures was reduced by 35% and the risk of death was reduced by 28% in patients receiving bisphosphonate therapy compared with patients only receiving supplemental vitamin D and calcium[58]. However, only 3.6% of patients with hip fracture are prescribed a bisphosphonate after fracture, and adherence to treatment declines heavily over time[59].

R Is for Referrals

When geriatric patients with hip fracture are discharged from the hospital, "it is critical that [their] primary care providers be notified of…the type of procedure that was performed…. complications encountered, weight-bearing status, expected course, a description of any unresolved issue, and specific plans for follow-up treatment and visits."[60] In the spirit of that recommendation, Own the Bone advocates that a physician referral letter be sent to the primary care provider after discharge for geriatric patients with hip fracture. If used, this letter reports the patient's injury and may also report the results of tests in the hospital and the recommendations for additional ones (e.g., vision and bone mineral testing). The core feature of this checklist item is that geriatric hip fracture care cannot be limited to the acute hospitalization. Gaps in care, if present, often appear after hospital discharge. To combat that, good communication is essential.

E Is for Environmental Safety

The final checklist item addresses whether the patient has a safe place to go after discharge. Unfortunately, the patient's home may not be that place. Indeed, the home environment may play a role in up to one-half of falls in the elderly[61]. The Centers for Disease Control and Prevention (CDC) has therefore proposed a series of steps to find potential dangers within the home[62]. This intervention increased patient function and confidence in daily activities and decreased the number of home hazards and fear of falling[63]. Although home-hazard interventions help to reduce fall hazards, it may not be feasible to completely make a patient's home fall-proof before discharge: the necessary steps (e.g., installing handrails and lighting or removing frayed carpets) take time[64]. In these cases, a social worker's intervention may be needed. The key element of this checklist item is that the quality of the post-discharge environment must be formally considered[65].

Limitations of the APGAR SCORE Checklist

The APGAR SCORE checklist is not derived from a systematic review. Rather, it is the product of the collective experience of the authors supplemented by organized review of the literature. Still, even without compelling evidence for the effectiveness of any one item or another, we suggest that the checklist can and should be implemented empirically; the steps that it proposes are not apt to be harmful and are likely to be helpful. Further, these items do not generate high direct costs.

We acknowledge that additional items plausibly deserve a place on the list, for example, assessment for impaired hearing (which is common, is often amenable to palliation, and may itself be a risk for falls), skin assessment for pressure ulcers, and optimizing bowel and bladder health.

One can also argue that a checklist is not needed if there is a standardized order set[66] that includes the list. Standardized orders for hip fracture are apt to be commonly found at centers[67] that take care of many geriatric patients with hip fracture, but prepared order sets can be built even at low-volume facilities. It is our hope that our checklist can serve as the basis for creating such order sets.

We further acknowledge that although the APGAR SCORE checklist does not generate high costs directly, there can be substantial outlays related to its implementation; for example, inexpensive diagnostic tests may trigger expensive treatments. These secondary costs may be an impediment to implementing this program. In particular, one disincentive is the recently enacted Comprehensive Care for Joint Replacement (CCJR) program, a bundled payment plan that includes all geriatric patients with hip fracture treated with arthroplasty[68]. This program provides a comprehensive payment for all care within the first 90 days of the surgical procedure. Spending on seemingly unrelated topics (a vision examination and a possible cataract surgical procedure) is counted toward the bundle payment and thus applying our checklist may be costly to the institution.

Conclusions

Geriatric hip fracture is a disease that is defined by an osseous injury, although the bone is only part of a larger problem. Optimal care of geriatric patients with a hip fracture must

include excellent fracture care, but it must also not stop there. We suggest a 10-point checklist, given by the acronym APGAR SCORE. For the newborn, the Apgar score has been criticized as an imperfect tool[69]. Likewise, there are limitations to this proposal too. Still, earning a full 10 points on either of these tests will likely help patients to achieve the best possible outcomes. ■

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