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# Falls in older patients with cancer: Nursing and Allied Health Group of International Society of Geriatric Oncology review paper

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ABSTRACT

*Background:* Falls are a major health issue in older adults and are of greater concern among those with cancer due to effects of cancer and its treatments. This paper provides an overview of current literature on fall screening/assessment and interventions and a succinct summary of recommendations for oncology nurses to support this vulnerable population.
*Methods:* A comprehensive search for literature reviews on falls was conducted in Medline and CINAHL. A comprehensive Internet search was also performed for known guidelines on fall prevention and/or management published within the past 10 years. Search results were compared, contrasted, and summarized to develop clinical recommendations for nurses working with older adults with cancer. Levels of evidence were reported based on the Oxford Centre for Evidence-based Medicine.
*Results:* Six guidelines and 17 systematic reviews were identified. Having a history of falls was the most commonly identified fall risk factor/predictor. Multifactorial intervention and exercise appear to be the most commonly recommended. No fall assessment tools were consistently recommended as a reliable means of identifying those at risk for falls.
*Conclusion:* Assessing older patients for falls and fall risks is an important first step to identify those who may require further follow-up and intervention. Oncology nurses play a key role in optimizing health outcomes of older adults with cancer - through the use of evidence-based information, such as presented in this publication - and have the capacity to help reduce fall risks during and after treatment through information provision, advocacy, support, and promotion of physical activity.



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## 1. Background

Falls are a major health concern among older adults [1] and are of additional concern for those with cancer due to the disease and its treatments [2,3]. As the world's aging population continues to increase [4] and since the majority of patients treated in oncology practice are older patients, oncology care teams are faced with the challenge of providing effective individualized care for this growing population. Assessment and management of falls is imperative as falls have serious implications to older adults' functional status (FS) and quality of life (QoL), as well as disease trajectory and survival. Falls are often preventable [5] and many fall risk factors are amenable to targeted interventions, including exercises for balance and muscle strength [5], medication review [5], and cognitive function [5]. Appropriate assessments can help identify underlying causes and individuals at risk for falls, which, in turn, can help mitigate falls and their associated negative impact on older adults with appropriate interventions.

Research shows only one out of 10 self-reported recent falls by older patients with cancer are appropriately documented in the health care records [6]. Nurses in oncology clinics are well-positioned to proactively inquire about falls, perform comprehensive assessments, and communicate pertinent findings to oncologists, if indicated. Oncology nurses should closely monitor older patients who are undergoing active cancer treatment and provide advice on adjusting activities or surroundings, and help to maintain and improve activity levels, manage symptoms, and prevent falls [7,8]. The plethora of fall assessment and management literature for older adults and the compressed clinical schedules of the oncology care team can challenge oncology nurses as they strive to identify current best practice for fall management. The purpose of this paper is to provide an overview of the latest literature on falls regarding risk factors, screening/assessment, and interventions; and to present a succinct summary for oncology nurses who provide care to patients in inpatient and outpatient settings.

## 2. Methods

A comprehensive search for systematic reviews on falls was conducted by a health sciences librarian (APA) in OVID Medline (1946 to present, including Epub Ahead of Print, and In-Process & Other Non-Indexed Citations) and EBSCO CINAHL from 2007 to September 14, 2018. Search strategies were translated using each database platform's command language, and appropriate search fields. MeSH terms, CINAHL headings, and text words were used to search for the concepts of falls, fall prevention, and older adults. All searches were limited to English. An Internet search was also performed by the first author (S.S.) in Google for known guidelines on fall assessment, prevention, and/or management that were published in English within the past 10 years. Guidelines were sorted according to the inpatient and outpatient setting (although some guidelines were applicable to both) because fall risk factors are not necessarily the same across different settings [9]. For the sake of uniformity, the levels of evidence of interventions provided by the guidelines were converted according to the framework provided by the Oxford Centre for Evidence-based Medicine [10]. Level 1 evidence is from systematic review of randomized trials; Level 2 is from randomized trial/observation study with dramatic effect; Level 3 is non-randomized controlled cohort/follow-up study; Level 4 is from case-series/case-control studies, or historically controlled studies; Level 5 is from mechanism-based reasoning [10].

## 3. Results

Among the results from the comprehensive search, only guidelines, systematic reviews, and meta-analyses were selected. A total of six guidelines and 17 systematic reviews were deemed eligible. Four pertained to fall risk factors, five were concerned with fall assessment tools, while the rest concerned fall assessment and interventions.

## 4. Fall Risk Factors

Four systematic reviews were found regarding fall risk factors [3,11–13], wherein a number of known fall risk factors are described in the general older population. Among various risk factors, prior falls has been consistently identified as a fall risk factor in both inpatient setting and community setting in the general geriatric population [11,12], as well as within the geriatric oncology setting [3,13]. Impairment in activities of daily living (ADL) is a risk factor in community-dwelling older adults in both general geriatric as well as oncology settings [3,11]. See Table 1 for details on fall risk factors.

## 5. Fall Interventions

We identified five guidelines and six systematic reviews [5,14–18] that addressed fall interventions in the outpatient setting, and three guidelines and three systematic [15,19,20] reviews related to fall interventions in the inpatient setting (some overlap exists). An overview of these guidelines and their level of evidence can be found in Supplementary Tables 1 and 2.

### 5.1. Interventions - Outpatient

This section presents an overview of recommendations for fall interventions in the outpatient setting (See Table 2 for an overview of similarities and differences across guidelines). Comprehensive assessment plus individualized multifactorial intervention to address contributing risk factors is the most recommended actions for those who are at heightened risk for falls [21–25]. Exercise is the second most commonly

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**Table 1**
Risk factors from systematic reviews.

| Author/Title | Inclusion criteria | Finding | Level of evidence[a] |
|---|---|---|---|
| Inpatient | | | |
| Deandrea et al. (2010)<br>Risk factors for falls in older people in nursing homes and hospitals: A systematic review and meta-analysis | - At least 80% of the sample aged 65 years or older.<br>- Prospective study design.<br>- Number of subjects experiencing one or more falls during follow-up as an outcome. | Strong predictors of future falls:<br>- history of falls<br>- use of walking aids<br>- disability | 2 |
| Wildes et al. (2015)<br>Systematic review of falls in older adults with cancer | - Retrospective cohort studies, case-control studies, prospective cohort studies or clinical trials in which at least either all patients had cancer, or a diagnosis of cancer defined a subgroup, and falls were a primary or secondary outcome. | (based on significant findings from at least one study which included cross-sectional studies)<br>- age<br>- gender<br>- chronic kidney disease<br>- COPD[b]<br>- use of assistive device<br>- prior fall<br>- ECOG[c] score<br>- physical performance measure<br>- cognitive impairment<br>- delirium<br>- antidepressant use<br>- antipsychotic use<br>- corticosteroid use<br>- benzodiazepine use<br>- opiate use<br>Cancer symptom/treatment related risk factors<br>- fatigue<br>- metastases<br>- fever<br>- low blood pressure<br>- anemia requiring blood transfusion pain (as protective factor) | 2 |
| Sattar et al. (2016)<br>Falls in older adults with cancer: a systematic review of prevalence, injurious falls, and impact on cancer treatment | Clinical trials, cross-sectional, cohort, case-control, and qualitative studies in which the entire sample or a sub-group of the sample were older adults aged 60 and above, had cancer, in which falls were examined as a primary or secondary outcome and published in English. | (based on statistically significant findings in at least 2 prospective studies)<br>- cognitive impairment | 2 |
| Outpatient | | | |
| Tinetti et al. (2010)<br>The patient who falls: "I's always a trade-off" A systematic review | Prospective cohort studies that investigated more than 1 risk factor among community-living participants and used multivariate analyses | Independent fall risk factors (in order of strength of evidence):<br>- prior falls<br>- balance difficulties<br>- visual impairment<br>- decreased muscle strength<br>- polypharmacy (>4 medications)<br>- use of psychoactive drugs<br>- walking difficulties and gait impairment<br>- depression<br>- dizziness or orthostatic hypotension<br>- functional limitations<br>- >=80 years of age<br>- female sex<br>- incontinence<br>- cognitive impairment<br>- arthritis<br>- diabetes<br>- pain | 2 |
| Wildes et al. (2015)<br>Systematic review of falls in older adults with cancer | -Retrospective cohort studies, case-control studies, prospective cohort studies or clinical trials in which at least either all patients had cancer, or a diagnosis of cancer defined a subgroup, and falls were a primary or secondary outcome. | (based on significant findings from at least one study)<br>- age<br>- white race<br>- gender<br>- comorbidities<br>- ADL dependence<br>- IADL dependence<br>- Timed up and Go Test score | 2 |

(continued on next page)

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**Table 1** (*continued*)

| Author/Title | Inclusion criteria | Finding | Level of evidence[a] |
|---|---|---|---|
| | | - prior falls<br>- cognitive impairment<br>- marital status<br>- depression<br>- antidepressant use<br>- benzodiazepine use<br>Cancer symptom/treatment related risk factors<br>- pain<br>number of cycles of neurotoxic chemotherapy | |
| Sattar et al. (2016)<br>Falls in older adults with cancer: a systematic review of prevalence, injurious falls, and impact on cancer treatment | Clinical trials, cross-sectional, cohort, case-control, and qualitative studies in which the entire sample or a sub-group of the sample were OA aged 60 and above, had cancer, in which falls were examined as a primary or secondary outcome and published in English. | (based on statistically significant findings in at least 2 prospective study)<br>- prior falls | 2 |

[a] Based on the Oxford Centre for Evidence-based Medicine.
[b] Chronic obstructive pulmonary disease.
[c] Eastern Cooperative Oncology Group.

recommended intervention from the guidelines. Group and home-based exercise training incorporating balance, gait, and strength training [5] and Tai Chi [14] have been found to be effective in preventing falls. Exercise activity/programs should be titrated according to the person's current functional level and abilities [22]. Moreover, in terms of preventing injurious falls, exercise alone and various combinations of interventions (e.g. visual assessment, environmental assessment and modification, and calcium supplementation etc.) can help lower risk of injurious falls [15]. See further discussion about vitamin D below.

Other commonly recommended interventions include routine fall assessment [21–23,25] (frequencies ranging from every clinical encounter [23] to at least once a year [24]) and gait and balance assessment [22,23,25]. Recommendations regarding Vitamin D supplementation is mixed [21–25], with the most recent guideline recommending against Vitamin D supplementation as a means of fall prevention [21]. Dietary intervention (including calcium supplementation to optimize bone health [22] and nutritional supplement for those who are malnourished) [16]; home safety evaluation [23,25] and referral to geriatrician or primary care provider for further assessment and intervention for potentially modifiable issues [22,25]; medication review [22,23,25] to identify for potential high-risk medications that have been known to contribute to falls (e.g. psychotropic and antihypertensive medications); assessing for postural hypotension [23], and providing education to the older adult and their caregiver (as appropriate) in conjunction with other interventions [22,23]. (See Table 2 and Supplementary Table 1).

### *5.2. Interventions - Inpatient*

This section summarizes recommendations of fall interventions in the inpatient setting. An overview of similarities and differences across the three guidelines by RNAO [22], NICE [21], and the Agency for Healthcare Research and Quality (AHRQ) [26] is described in Table 3 and an overview of the guidelines and levels of evidence in Supplementary Table 2. Recommendations include: assessing for fall risk on admission (or after significant change in health status), exercising universal fall prevention [23], assessing for fall risk factors daily, and rounding [22,23] as a proactive strategy to prevent falls [22]. Additionally, for those admitted to the hospital after having a fall, home hazard evaluation should be offered and relevant safety interventions should be considered [21]. Exercise and physical training to improve strength and balance [22], ideally, tailored to the patient's current abilities and functioning is essential [22]. Additionally, exercise alone and in various multifactorial combinations (e.g. visual assessment and treatment; environment assessment and modification; vitamin D and calcium supplementation etc.) is associated with a decreased risk of injurious falls [16]. Implementing multifactorial interventions [14,24], and patient education as part of multifactorial intervention should also been included.

## 6. Screening Tools

Five reviews were found regarding fall screening tools [27–31]. The Berg Balance Scale (score ≤ 50 points), Timed Up and Go test (≥12 s), and the 5 times sit-to-stand times (≥12 s) are suggested to be the most evidence-supported functional measures for ascertaining risk for future falls in the community setting [29]. However, in other reviews, no fall assessment tool is recommended [27,28]. In particular, one review reports that the Timed Up and Go test has limited capacity in predicting falls in community-dwelling older adults and thus should not be used as a stand-alone tool to identify those who are at risk of falls [27].

For fall risk screening tools in the inpatient setting, Hendrich Fall Risk Model II (HFRM II) is among the most tested screening tools [30]; however, so far, no screening tool has demonstrated satisfactory predictive accuracy and predictive values that are high enough for identifying older inpatients at risk for falls [30]. Another recent review [31] examining 26 fall assessment tools concludes that fall assessment tools currently used in older adults do not demonstrate high predictive validity for distinguishing between high and low fall risks. The author of this review recommends using two assessment tools together instead of using a single measure due to the multifactorial nature of falls. An overview of the five reviews and tools recommended is described in Table 4.

## 7. Discussion

Across the literature reviewed, a history of falls is the most commonly identified risk factor for falls among older adults in both inpatient and outpatient setting. Therefore, older patients should be routinely asked if any falls have recently occurred. Although a variety of intervals have been suggested, asking about falls at *every* clinical encounter, especially in the outpatient setting, is preferable because older patients' functional status may deteriorate quickly due to progression of disease and/or concurrent effects of cancer treatment. One in five older patients develop new impairments in their ADL between the first and second cycles of chemotherapy [32], an established risk factor for falls in this population [33–35]. Therefore, older patients' fall risks are not static, but rather, can change dramatically during cancer treatment [3]. While many health professionals' practices encompass assessing of

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**Table 2**
Summary of similarities and differences of guidelines (outpatient setting).

| Intervention | USPSTF (2018) | RNAO (2017) | NCCN (2017) | NICE (2017) | AGS/BGS (2010) |
|---|---|---|---|---|---|
| Routine fall assessment | | ✓ | ✓ | ✓ | ✓ |
| Gait and balance assessment | | ✓ | ✓ | | ✓ |
| Comprehensive assessment + individualized multifactorial intervention | ✓ | ✓ | ✓ | ✓ | ✓ |
| Ask about frequency and circumstances of falls | | ✓ | ✓ | | ✓ |
| Obtain history of relevant risk factors | | | | | ✓ |
| Offer exercise program incorporating balance, gait, and strength training | ✓ | ✓ | ✓ | | ✓ |
| Vitamin D supplementation | X | ✓ | ✓ | | ✓ |
| Encourage dietary intervention to optimize bone health | | ✓ | | | |
| Referral to geriatrician and primary care provider | | ✓ | ✓ | | |
| Home safety evaluation | | | ✓ | | ✓ |
| Medication review | | ✓ | ✓ | | ✓ |
| Assess for postural hypotension | | | | | ✓ |
| Assess foot/footwear problem | | | | | ✓ |
| Education | | ✓ | | | ✓ |
| Engage patient in intervention | | ✓ | | | |
| Communication of fall risk and intervention plan to next healthcare provider to ensure continuity of care | | ✓ | | | |
| Community-dwelling older adults with recurrent falls | | | | | |
| Refer for strength and balance training | | | | ✓ | |
| Refer to appropriate clinicians/interprofessional team for further assessment and identify appropriate interventions | | ✓ | | | ✓ |

AGS/BGS – American Geriatrics Society/British Geriatrics Society.
LE – Level of evidence.
NCCN – National Comprehensive Cancer Network.
NICE – The National Institute for Health and Care Excellence.
RNAO – Registered Nurses Association of Ontario.
USPSTF – US Preventive Task Force.
X – Recommended against.

individuals' functions, occupational therapists (OT) are experts whose key focus includes evaluating ADL performance and implementing tailored modifications to increase safety [36]. Therefore, expertise of OT can be helpful in interdisciplinary efforts to identify older patients with ADL impairments.

A variety of fall intervention strategies have been recommended by the guidelines we reviewed. Multifactorial assessment and intervention and exercise are the most commonly recommended fall interventions in the guidelines [21–25]. A caveat is that fall assessment must be followed by intervention strategies; if not, the assessment is of limited use [37]. It is important to note that, while moderate physical activities and exercise has been shown to help decrease risk of falls and fall injuries in older adults by way of weight control, maintaining healthy muscle, bone, and joints [38], as well as improved mobility, balance, and reaction time [39], engaging in vigorous physical activities (e.g. intensive running) could lead to increased falls in older adults [40]. One way to try to mitigate this is an evaluation by a physical therapist (PT). PTs are experts in fall risk assessment who have historically held a crucial role in exercise prescription for fall prevention that are safe for older adults, and have been recognized as key members of fall and balance clinics [41]. Using an individualized approach to exercise prescription, PT can tailor training programs for older adults based on findings from physical assessment instead of "off-the-shelf" exercise programs [42]. Hence, PT are valuable interdisciplinary members in helping tailor exercises for older patients in the oncology context. Furthermore, activities including outdoor walking or mall walking are likely the most feasible and accessible ways of exercising that enhance strength, balance, and flexibility, in turn aiding the reduction of falls [40].

Polypharmacy has been found to be highly prevalent among older adults with cancer and is associated with impaired physical function

**Table 3**
Summary of similarities and differences of guidelines (inpatient setting).

| Intervention | RNAO (2017) | NICE (2017) | AHRQ (2013) |
|---|---|---|---|
| Assess for fall risks on admission | ✓ | | |
| Exercise universal precautions | ✓ | | ✓ |
| Assess for fall risk factors daily | | | ✓ |
| Perform hourly rounds | ✓ | | ✓ |
| When a fall occurs during hospital stay, check for signs and symptoms of fracture and potential for spinal injury before the person is moved | ✓ | ✓ | |
| When a fall occurs during hospital stay, provide a medical examination | ✓ | ✓ | |
| When a fall occurs during hospital stay, provide a post-fall assessment and implement changes | ✓ | | |
| If a patient is admitted to hospital after a fall, offer home hazard assessment and safety intervention | | ✓ | |
| Exercise intervention | ✓ | | |
| Implement multifactorial intervention as part of an interdisciplinary team to prevent falls | ✓ | | |
| Patient education | ✓ | | |
| Environmental modification | ✓ | | |
| Consider using hip protector to reduce risk of hip fracture | ✓ | | |
| Communication of fall risk and intervention/care plan to next health care provider to ensure continuity of care | ✓ | | |
| Ensure information is provided in appropriate language and in a variety of format | ✓ | | |

AHRQ - US Agency for Healthcare Research and Quality.
RNAO - Registered Nurses Association of Ontario.
NICE – National Institute for Health and Care Excellence.

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**Table 4**
Overview of available tools compared in systematic reviews.

| Author/Title | Recommendations by authors about tools | Psychometric properties |
|---|---|---|
| Park (2017)<br>Tools for assessing fall risk in the elderly: A systematic review and meta-analysis | No tools showed sufficiently high predictive validity to discriminating between high and low fall risks<br>Better to use two assessment tools together instead of using a single measure | N/A |
| Lusardi (2017)<br>Determining risk of falls in community-dwelling older adults: A systematic review and meta-analysis using posttest probability | Combining the following 3 performance measures may help identify possible modifiable risk factors:<br>Berg Balance Scale score (≥50 points)<br>Timed Up and Go (TUG) times (≥11 s)<br>5 times sit-to-stand times (≥12 s) | Not available |
| Matarese (2015)<br>Systematic review of fall risk screening tools for older patients in acute hospitals | No tool can be recommended<br>Hendrich Fall Risk Model II demonstrated higher sensitivity than STRATIFY<br>STRATIFY showed higher specificity.<br>However, Youden index showed low prognostic accuracy in both tools | Hendrich<br>Sensitivity: 0.92 (0.84–0.97)<br>Specificity: 0.37 (0.33–0.41)<br>STRATIFY<br>Sensitivity: 0.63 (0.54–0.69)<br>Specificity: 0.71 (0.67–0.73) |
| Barry et al. (2014)<br>Is the Timed Up and Go test a useful predictor of risk of falls in community dwelling older adults: a systematic review and meta-analysis | No cut point is recommended for TUG<br>TUG has limited capacity in predicting falls in community-dwelling older adults and thus should not be used as a stand-alone tool to identify those who are at risk of falls | At >13.5 s<br>Sensitivity (0.31, 95% CI 0.13–0.57)<br>Specificity (0.74, 95% CI 0.52–0.88) |
| Schoene et al. (2013)<br>Discriminative ability and predictive validity of the timed up and go test in identifying older people who fall: systematic review and meta-analysis | No cut point is recommended for TUG<br>(Predictive ability and diagnostic accuracy poor to moderate)<br>TUG is not useful in discriminating fallers vs non-fallers among healthy, high-functioning older adults (but is but is more useful in older adults who are less healthy and lower functioning. | Pooled mean difference between fallers and non-fallers:<br>0.63 s (95% confidence (CI) = 0.14–1.12 s) for high-functioning to older adults<br>3.59 s (95% CI = 2.18–4.99 s) for low-functioning older adults |

as well as being pre-frail and frail [43]. Extra attention should be given to assessing for symptoms of side effects of medications as well as for falls in older patients using mediations that are associated with increased fall risks (e.g. benzodiazepines, antihypertensives) [44].

The Timed Up and Go (TUG) test may be used as a quick tool for assessing functional mobility. An advantage of this test is that it can be used in any setting [22]. However, although earlier literature reports a sensitivity of 80% (using ≥13.5 s cut off) and a specificity of 100% (using ≥13.5 s cut off) [45], systematic reviews included in the current paper do not appear to endorse a particular cut off nor strongly recommend TUG or any other fall assessment tools. it is important to note that the US Preventive Services Task Force (USPSTF) in 2018 [24] also states that currently there is no single tool/quick approach which is sufficiently reliable enough to help identify older individuals who are at risk for falls. Therefore, consideration of quick, multifactorial fall risk screening to obtain more information to help identify older adults at risk for falls is needed [28]. Nonetheless, given the need for efforts in screening and identifying older adults who are at risk for falls, for practical reasons, simple tests such as the TUG or gait speed [46] could be easily done in busy clinic settings. Additionally, it is important to take into account safety consideration during tests (e.g. to stay within arm's reach of the older adult in case they lose their balance). Moreover, in terms of inpatient setting, McKechnie et al. caution that predicting falls in inpatient settings is a complex issue, and that clinicians must be cognizant of the limitations of fall risk assessment tools in predicting falls [47]. The suggestion of using two fall assessment tools rather than a single tool [31] might also be a viable measure until research develops a more reliable means to measure fall risks. Notably, the Short Physical Performance Battery (SPPB), a tool that includes static and dynamic balance, gait speed, and repeated chair stands [48] is not included in the mentioned reviews. SPPB scores are predictive of community-dwelling older adults who are at risk for falls [49,50], who might suffer from higher all-cause mortality [51], as well as at-risk drivers who are likely to be in motor vehicle accidents [52]. The SPPB may be a very useful tool for outpatient oncology nurses in identifying older patients who are at risk for falls.

## 8. Conclusion

Falls in older adults with cancer will continue to be of increasing importance as this population increases [53]. In this paper, we provide an overview and summary of fall risk factors, fall assessment tools, and fall interventions based on established guidelines and published reviews. Through our review of current literature, we conclude that assessing older patients for falls and fall risks would be a simple yet important first step to identify those who may require further follow-up and intervention. Oncology nurses and allied health professionals, including (but not limited to) physical therapists and occupational therapists, play a key role in optimizing health outcomes of older adults with cancer. Through the use of evidence-based information, such as presented in this publication they have the capacity to help reduce fall risks for patients during and after treatment through information provision, advocacy, support, symptom management, and promotion of physical activity to help manage or reduce risk of falls.

## Conflict of Interest

This review is not funded. The authors have no conflict of interests to declare.

## Study Concepts

SS, CK, PB, PSB, MP.

## Study Designs

SS, CK, PB, PSB, KM, APA, MP.

## Data Acquisition

SS, APA.

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### Quality Control of Data and Algorithms

SS, CK, MP.

### Data Analysis and Interpretation

SS, CK, PB, PSB, KM, MP.

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Study concepts: SS, CK, PB, PSB, MP.
Study design: SS, CK, PB, PSB, KM, APA, MP.
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Quality control of data and algorithms: SS, CK, MP.
Data analysis and interpretation: SS, CK, PB, PSB, KM, MP.
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### Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jgo.2019.03.020.

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