Guidelines for optometrists to help prevent falls in older patients

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Falls are defined as “an unexpected event in which the person comes to rest on the ground, floor or lower level.” Many factors have been linked to falls risk. Of these factors, problems with vision are one of the most important, and many of these vision problems can be avoided or are reversible.[1,2] This publication provides optometrists and other health care professionals with a current overview of the importance of vision in preventing falls, along with recommendations for optometrists regarding how to best manage their older patients to minimise the risk of falls.

Falls and their consequences in older people

Falls are common in older people, with at least a third of people over the age of 65 years reporting falling at least once per year, with about half of these people reporting multiple falls.[3-5] Falls rates are higher in older and frailer people, being about 60% in people aged over 90 years and in those that live in care homes.[3-5] With increasing age, the incidence of fall-related hospital admissions increases exponentially; by the age of 65 years approximately 57% of all admissions are due to fall-related injury.[3] The mortality rate associated with falls also greatly increases with age, with falls accounting for 84% of accidental deaths in persons 65 years and over.[3] Falls can also lead to “long lies”, where people can remain on the floor for over an hour following a fall. This is more common in frail and/or ill older people who live alone and can have devastating psychological consequences, with loss of confidence and reluctance to venture outside the home being common responses.[3] This can lead to social isolation, with fear of falling even deterring excursions such as shopping trips and avoidance of activities in the house, such as bathing and dressing.[3] Falling therefore represents a high-risk problem for the older population, and as the ageing population continues to increase, the impact on related health care costs will become considerable.

Falls are not chance events

Falls have traditionally been viewed as accidents that are unpredictable and, therefore, unavoidable. However, there is clear evidence that although falls in older people are multifactorial, they are associated with well-defined intrinsic and/or extrinsic factors. A list of intrinsic and extrinsic factors associated with falls in older adults is shown in Table 1.[3-5] The more risk factors a person has, the more likely they are to fall. For example, Tinetti and colleagues[4] reported that the falls rate was 8% for people with no falls risk factors and increased with each additional risk factor. In people with four or more risk factors, the falls rate increased to around 78%. Extrinsic factors, many of which are related to aspects of the physical environment, are also important contributing factors for falls (Table 1).

TABLE 1. RISK FACTORS FOR FALLS [3-5]

Intrinsic risk factors	Extrinsic risk factors
Increasing age	Poor lighting
Female sex	Presence of trip hazards such as loose rugs
Gait and balance impairment	Inappropriate footwear
Systemic conditions such as arthritis, postural hypotension, stroke, diabetes and Parkinson's disease	Unsafe stairways (no handrail and steps of variable height)
Sedative use	Irregular floors
Taking multiple medications (greater than four, polypharmacy)	Unsuitable bed and bath designs
A history of falls	
Visual impairment	

Visual impairment increases the risk of falls

The prevalence of visual impairment increases with increasing age, with over 4% of Australians aged 60–69 years having impaired vision, rising to more than14% in those aged 80–90 years and over 32% for those aged over 90 years.[6] The prevalence is three times higher in Indigenous Australians.[7] Impaired vision is classified as vision levels that can impact on the ability to undertake everyday tasks, and is typically defined as binocular visual acuity worse than 6/12. There are several epidemiological studies (reviewed in Black and Wood[1], Elliott[2], Lord et al.[3]) that highlight visual impairment as being an important risk factor for falls. An important statistic highlighted by these review papers is that most of the visual impairment in patients admitted to hospital following a fall (around 75%) is correctable, either through updating a spectacle prescription or the surgical removal of cataracts.[8,9] Other epidemiological studies have also shown that uncorrected refractive error and cataract are the main causes of vision impairment in older adults, even in developed countries.[10] As such, many eye-care interventions could significantly reduce the number of falls occurring in older people.

The link between poor vision and falls

The most obvious way that vision impairment increases the risk of falls is through increasing the likelihood of tripping over obstacles in the travel path or misjudging the position of step edges or kerbs. Indeed, stairs, steps and kerbs are the most common causes of falls in older people with poor vision.[11,12] In addition, vision provides one of the key sensory inputs for the control of balance. Postural stability or balance is also controlled by the somatosensory system, which conveys information from the feet and legs and the vestibular system, which in turn provides information regarding the position of the body in relation to gravity and head movements. Postural stability is poorer when the eyes are closed as the patient then has to rely solely on somatosensory and vestibular system information. Importantly, balance control is more reliant on visual input when information from the somatosensory and vestibular systems are poor (for example, in patients with diseases such as peripheral neuropathy in diabetes or Meniere's disease).[13] Older people with vision impairment tend to adopt more cautious strategies when negotiating stairs: they tend to step more slowly so that a trip is less likely to become a fall, and lift their foot higher to avoid catching the step edge.[14] While these strategies help, it also means that the person stepping is in the single support phase for longer (only one leg is on the floor while the other leg swings over the step edge), which is the most dangerous part of the step phase and may make sideways falls more likely.[15]

Evidence from studies of eye-care interventions to reduce falls

Several trials have evaluated the potential benefits of eye-care interventions to prevent falls, yet these have not shown the expected reductions in falls rates.

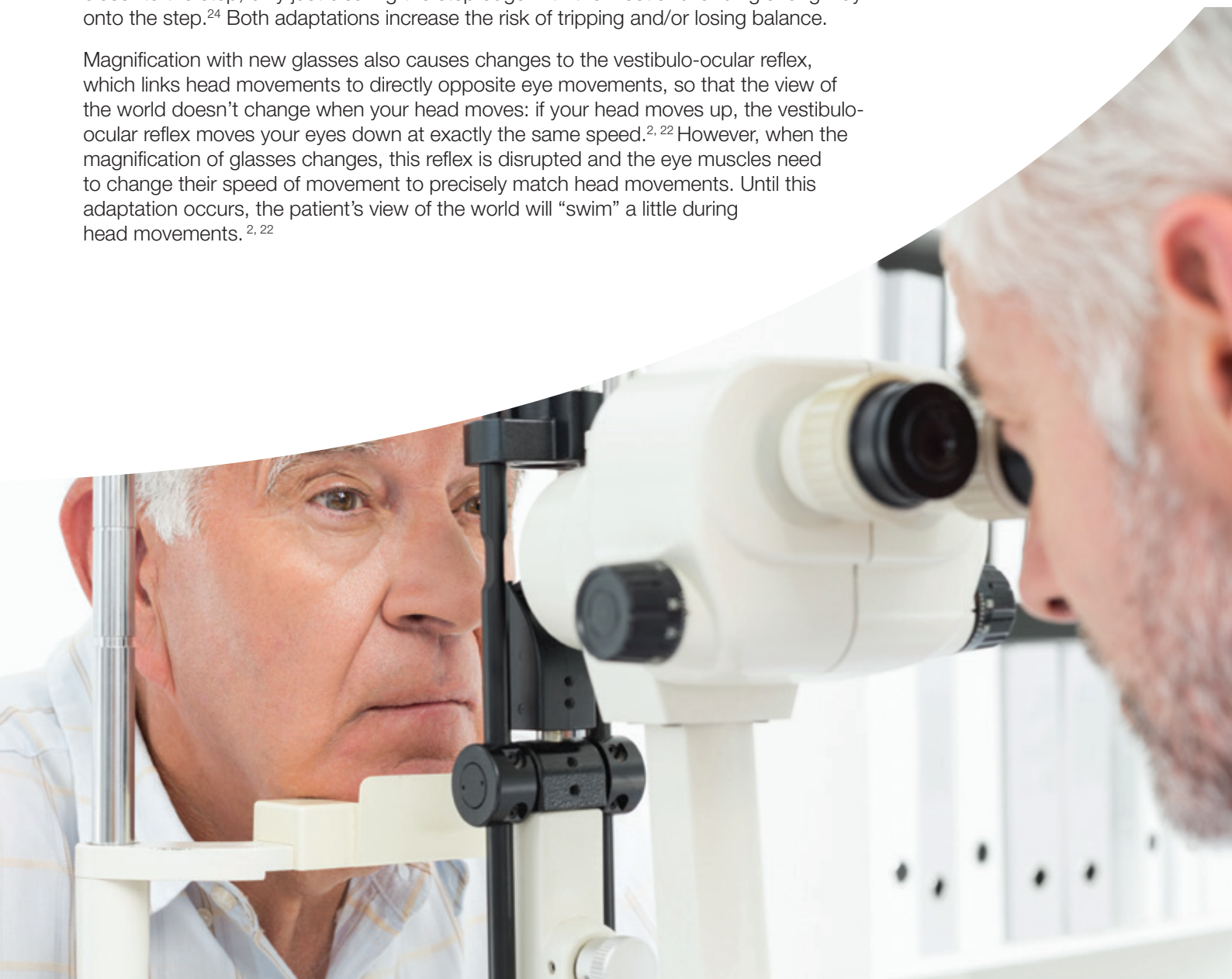
The most unexpected, but perhaps most revealing, is a randomised controlled trial (RCT) by Cumming et al.[16] Their trial included about 600 people, half who received an eye-care intervention involving visual function tests and eye examinations (92 received new glasses and 15 were referred for cataract surgery) and the other half were the control group, left to their 'usual care'. Their findings were the opposite of those expected, in that in the intervention group falls rate increased when compared to the control group. The most likely explanation is that this was caused by adaptation problems for some of the participants who received large changes in refractive correction in their glasses. Seventy-four per cent of participants who received a large change in correction (defined as 0.75D or greater of sphere or cylinder, axis changes of ≥ 10° up to 0.75DC and ≥ 5° for >0.75DC, any prism change or an introduced anisometropia of ≥ 0.75DS) fell at least once, compared to 53% of those who had received smaller changes in refractive correction.[16] The trial did not include expedited cataract surgery, and only 7 of the 15 referred for cataract surgery received treatment during the trial.

Several studies have examined the effect of cataract surgery for reducing falls rates with mixed results.[17-20] While two recent Australian prospective cohort studies[19, 20] and one UK RCT[17] reported a significant reduction in falls following surgery, other studies have failed to find improvements in falls rates. This is likely to be because any improved visual function due to cataract removal is offset by increased risk of falling due to large changes in refractive correction.[2,18,19,21] The large refractive changes that occur following some cataract surgeries can increase falls risk,[19,21] as can re-adapting to bifocals and progressive addition lenses (PALs or progressives) many months after not wearing them prior to, and immediately following, cataract surgery.[2,18] Optometrists therefore play a particularly important role in ensuring that adaptation to refractive correction following cataract surgery is as easy as possible.

Why might some new glasses increase falls?

Large changes in refractive correction provide improvements in vision, but can also result in changes such as magnification and distortion that older people in particular can find difficult to adapt to.[22] Normal age-related changes in refractive correction include a hyperopic shift and a change in astigmatism from with-the-rule to against-the-rule. However, larger changes in correction can occur with cataract, where nuclear cataract results in myopic shifts and cortical cataract produces astigmatic changes in cylinder power and/or axis.[23] Astigmatic changes cause distortion, with patients complaining of floors and doors sloping,[22] and oblique astigmatic changes increasing symptoms of dizziness,[18] with obvious ramifications regarding mobility and falls. Hyperopic shifts provide additional magnification, while myopic shifts cause additional minification. These might not seem to be that significant, until consideration is given to the accuracy needed to negotiate steps and stairs and avoid hitting a step edge.[12, 14, 15] With magnification from positive lenses, steps look closer and bigger so that prior to adaptation, older people place their leading foot further from the step and often place their foot on the step with their heel hanging over the edge.[24] With minification from negative lenses, steps look further away and smaller so that prior to adaptation, older people place their leading foot closer to the step, only just clearing the step edge with their feet and landing a long way onto the step.[24] Both adaptations increase the risk of tripping and/or losing balance.

Magnification with new glasses also causes changes to the vestibulo-ocular reflex, which links head movements to directly opposite eye movements, so that the view of the world doesn't change when your head moves: if your head moves up, the vestibulo-ocular reflex moves your eyes down at exactly the same speed.[2, 22] However, when the magnification of glasses changes, this reflex is disrupted and the eye muscles need to change their speed of movement to precisely match head movements. Until this adaptation occurs, the patient's view of the world will "swim" a little during head movements. [2, 22]



Bifocals, progressive addition lenses and falls

Accident and epidemiological studies have indicated that bifocal and PAL wearers have a higher risk of 'edge of step' accidents[25] and frail, older bifocal and PAL wearers are twice as likely to fall compared to single vision lens wearers.[26] A large proportion of falls are reported to occur outside the home, presumably due to tripping over obstacles not seen because of blur in the lower visual field from the near vision correction.[26] This effect is greatest in older people when the near addition power is higher and the range of clear vision when viewing the ground is most restricted. Optometrists typically encourage patients who wear bifocals or PALs to "tuck their chin in" when stepping over kerbs or going up and down stairs, so that they can look through the distance portion of their glasses, to provide a reasonably clear view of kerbs/stairs. However, this strategy does not appear to be used by people who have worn bifocals and PALs for many years.[27]

Other attributes of bifocals that may lead to a greater risk of falls include image jump over the bifocal edge. Some texts also suggest an accompanying visual field loss, although Walsh[28] suggests there is actually diplopia at the edge itself; diplopia and image jump vary with add power and segment type and are largest for the high powers worn by older patients and with large round segment bifocals.[28] Other attributes of PALs that may lead to a greater risk of falls include peripheral distortions, which are again greatest when the add power is higher. Laboratory-based studies have shown that long-term PAL and bifocal wearers use much more variable foot placements when stepping up or down and are more likely to hit the step edge than when they are provided with single vision glasses incorporating their distance prescription only.[27] An Australian RCT of an intervention involving additional distance-only single vision glasses for outdoor wear versus a control condition of 'usual care' of long term bifocal and PAL wearers, suggested that for active participants, there was a reduction in falls in the intervention group.[29] However, it must also be noted that inactive participants who received the additional single vision glasses actually had an increased rate of falls.[29] In addition, it appears that the single vision glasses prescribed in the study were tinted or photochromic (likely offered to help recruitment to the study, as the researchers found it difficult to persuade people to swap their bifocals/PALs for single vision lenses, even just for outdoor use), so that it could be argued that any improvement in falls rate could have been due to a combination of distance-only single vision lenses and reduced glare resulting from the tint.

Guidelines for optometrists

The following recommendations are based on the current literature in this area in reducing the risk of falls in older patients presenting for an eye examination.

1. Adaptation of the case history

1.1 It is important to understand which patients are most at risk of falling, based on the intrinsic risk factors shown in Table 1. The presence of more risk factors increases the risk of future falls.[3-5]

1.2 The case history should include determination of any history of falls in the previous 12 months, as this is an important risk factor. It is worth noting that the patient may not directly attribute their falls to their vision.

1.3 It is important to find out when glasses are actually worn and particularly whether older patients always wear their distance glasses when walking outside the home.

1.4 Similarly, it can be useful to determine whether bifocal/PAL wearers report any problems with steps and stairs when wearing their glasses and whether they remove their bifocals/PALs when negotiating stairs.[2]

2. Management of patients at moderate-high risk of falling

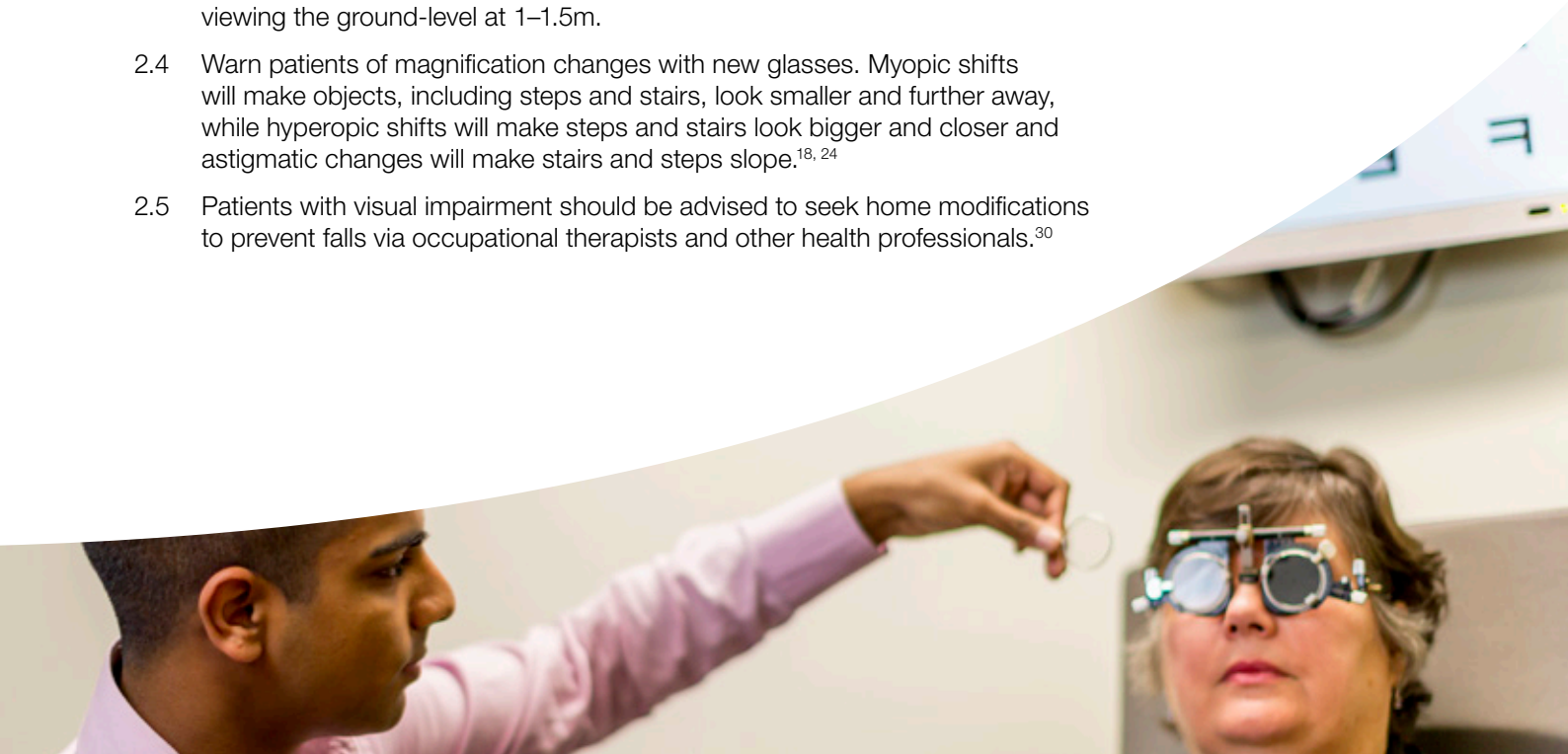
2.1 Promoting regular eye exams can be useful, so that regular small changes in refractive correction can be made thus avoiding the need for larger changes in correction, which have been shown to lead to increased falls.[2, 16, 19]

2.2 Suggest early referral for first eye cataract surgery as appropriate.[17,19]

2.3 Advise ‘at-risk’ patients to keep their distance glasses on when walking outside the home as this could reduce the fall risk. However, note that unaided low myopes will have a clear view of the travel pathway, steps and stairs when viewing the ground-level at 1–1.5m.

2.4 Warn patients of magnification changes with new glasses. Myopic shifts will make objects, including steps and stairs, look smaller and further away, while hyperopic shifts will make steps and stairs look bigger and closer and astigmatic changes will make stairs and steps slope.[18, 24]

2.5 Patients with visual impairment should be advised to seek home modifications to prevent falls via occupational therapists and other health professionals.[30]



3. Prescribing to patients at moderate-high risk of falling

3.1 Any change in refractive correction should be conservative. Be very careful in changing the correction of an 'at-risk' patient by more than 0.75DS.[2,16,22,31]

3.2 Be very careful in making astigmatic changes, particularly if oblique. Make partial changes in cylinder and axis as appropriate and provide appropriate advice to patients regarding these changes.[2,16,22,31,32]

3.3 Be wary of using a monovision approach with 'at-risk' patients because of the loss of stereoacuity.[2]

3.4 Do not prescribe bifocals/PALs if 'at-risk' patients currently wear single-vision glasses or if 'at-risk' patients are emmetropic or minimally ametropic and are used to walking about without glasses.[29]

3.5 Long-term wearers of bifocals/PALs with minimal ametropia can be advised that they are less likely to fall if they remove their glasses when walking outside their own home. If they have significant ametropia and participate in frequent outdoor activities, they should be advised to use distance single vision (SV) glasses when outside their own home (other than when driving or shopping); prescription SV sunglasses may also be useful.[2,29]

3.6 Long-term wearers of bifocals/PALs with significant ametropia who take part in little outdoor activity should continue to wear bifocals/PALs for most activities.[29]

4. Prescribing to patients following cataract surgery

4.1 Ensure that the patient is involved in the decision making regarding their post-operative refractive error. For example, some long-term myopes who have been myopic all their life might wish to keep distance glasses and read without glasses post-surgery (i.e. surgeons would target slight myopia), rather than lose their distance glasses and have to read with glasses. This would also reduce the magnitude of change in refractive error following surgery, which may reduce falls rate.[19]

4.2 Make conservative changes in refractive correction,[2,16,18,19,21,22] particularly astigmatic correction.[2,18,32] Any astigmatic correction should be kept the same as pre-surgery if possible, particularly the axis. Otherwise, the overall cylinder value should be reduced (equality approached in the cylinder values and symmetry approached in the axes) and not prescribed if possible.[2,18,32]

4.3 Reduce the use of bifocals and PALs in active older patients.[18,29]

4.4 Provide reduced reading power bifocals/PALs that provide safer walking but allow adequate short-term reading[33] for patients who wish to retain bifocals/PALs. This could be combined with a full addition bifocal/PAL or reading glasses for near work.

4.5 Provide new lenses in between the first and second eye surgery if the patient intends to wear distance glasses after second eye surgery.[2,18] A balance lens could be provided where appropriate for the cataractous eye to avoid anisometropic complications.

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