Discriminative ability and predictive validity of the Timed Up and Go test in identifying older people who fall: systematic review and meta-analysis

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CRD summary
The authors concluded that the Timed Up and Go test did not usefully discriminate fallers from non-fallers in healthy high-functioning older people but was more useful in less healthy lower-functioning older people. This was a generally well-conducted review but the evidence had limitations and test differences were small. The recommendations for practice seem appropriate and reliable.

Authors’ objectives
To investigate the discriminative ability and accuracy of the Timed Up and Go functional mobility test in identifying older people at risk of falling.

Searching
PubMed, EMBASE, CINAHL and Cochrane Central Register of Controlled Trials (CENTRAL) were searched from inception to September 2011 for publications in Dutch, English, French or German. Search terms were reported. Reference lists of included studies and reviews were searched manually.

Study selection
Eligible studies were randomised controlled trials (RCTs) and prospective or retrospective cohort studies that administered a timed version of the Up and Go Test which had to be sufficiently described. Eligible studies had to have 95% of participants aged at least 60 years or recruit from a geriatric institution. Studies had to compare fallers and non-fallers.

Included studies were in single or multiple fallers and non-fallers. Participants were Asian or Caucasian and most were female. Most studies were of independent-living older adults; others were in residents from long-term care facilities, individuals who attended day care, outpatient clinics, day hospitals and geriatric in-patient settings. Some participants were healthy; others had conditions such as chronic obstructive pulmonary disease, some form of cognitive impairment or mild impairments in functional mobility. One study separated indoor fallers and outdoor fallers. Timed Up and Go tests varied in walking speed and distance. Timed Up and Go cut-off values to discriminate between fallers and non-fallers varied considerably across studies.

Two reviewers independently screened studies for inclusion. Discrepancies were resolved through discussion with a third reviewer.

Assessment of study quality
Methodological quality was assessed using the QUADAS tool. Prospective studies were considered high quality if they had follow-up periods of 12 months (independent living), six months (care institution) or individual length of stay (hospital), at least monthly intervals of reporting falls and a sample size of 150 or more. Representativeness was assessed according to sampling (random) and response rate (>70%).

The authors did not state how many reviewers performed quality assessment.

Data extraction
Means or medians were extracted to calculate discriminative ability (mean differences and 95% confidence intervals) between fallers and non-fallers. Data were extracted to calculate diagnostic accuracy, including sensitivity and specificity, area under the receiver operating characteristic curve, positive and negative predictive values and positive and negative likelihood ratios and error rates. Study authors were contacted where necessary.

Two reviewers independently extracted data. Discrepancies were resolved through discussion with a third reviewer.
Methods of synthesis
A random-effects model was used to combine mean differences (MD) in time taken to complete the Timed Up and Go test between fallers and non-fallers, with 95% confidence intervals (CI). Statistical heterogeneity was assessed using the $\chi^2$ test and $I^2$ statistic.

Subgroup analyses were performed for independent-living older people versus those living in institutional settings and for healthy and high-functioning independent-living people versus studies that included higher- and lower-functioning people. Sensitivity analysis was performed for study design (prospective versus retrospective).

Associations between Timed Up and Go times and outcomes were calculated using univariate or multivariate regression analyses (adjusting for study characteristics).

Results of the review
Fifty-three studies (12,832 people, range 12 to 1,200 people) were included in the review; 25 had prospective designs. Follow-up ranged from four weeks to five years. Nine studies used representative samples and 14 studies followed the recommendations for falls data collection. Eight studies were considered high quality trials; four of these included representative samples.

The mean difference in Timed Up and Go performance was small but statistically significant. Performance was slower in healthy higher-functioning fallers compared to non-fallers (MD 0.63 seconds, 95% CI 0.14 to 1.12; seven studies; moderate heterogeneity $I^2=52\%$).

Timed Up and Go times were statistically significantly slower in fallers compared to non-fallers in studies of higher-and lower-functioning people living independently (MD 2.05 seconds, 95% CI 1.47 to 2.62; 21 studies; $I^2=61\%$) and slower in fallers compared to non-fallers in institutional settings (MD 3.59 seconds, 95% CI 2.18 to 4.99; nine studies; $I^2=0\%$).

The diagnostic accuracy of Timed Up and Go tests in correctly identifying fallers was poor to moderate across studies (results were reported for individual studies). Other results were reported in the review.

Authors' conclusions
Timed Up and Go was not useful in discriminating fallers from non-fallers in healthy high-functioning older people but was of more use in less healthy lower-functioning older people.

CRD commentary
The review question and inclusion criteria were stated clearly. The literature search was satisfactory although there was potential for language bias. Appropriate methods were used to assess study quality and the authors acknowledged that few studies were of high quality. Screening of studies and data extraction were performed in duplicate; it was unclear whether this was also the case for quality assessment so reviewer error and bias could not be ruled out.

Large numbers of studies and participants were included in the review. Almost half of the studies had retrospective designs. There was significant heterogeneity for some outcomes and the authors went some way to investigate this. The authors acknowledged that falls data collected retrospectively may have underestimated the number of falls and that reporting of population characteristics was often insufficient to categorise populations by fall risk.

This was a generally well-conducted review but the evidence had limitations and differences in Timed Up and Go times were only small. The authors' recommendations for practice seem appropriate and are likely to be reliable.

Implications of the review for practice and research
Practice: The authors stated that health professionals should not rely too heavily on Timed Up and Go times in clinical practice as applying a cut-off value from a study to clinical practice may result in incorrect clinical decision-making. The authors stated that quick multifactorial fall risk screens should be considered to provide additional information about identifying older people at risk of falls.

Research: The authors did not state any implications for research.
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