What can we do with stability measurements?

A comparison between two patient populations

West of Scotland Mobility and Rehabilitation Centre

Owen Mills, John Colvin, Caroline Newe

NHS Greater Glasgow and Clyde

Background

Adding components and reconfiguring wheelchairs can effect it's stability. Generally, there is an inverse relationship between a wheelchair's manoeuvrability and its rearward stability. Prescribers and patients must compromise between the two. Without a robust measurement process and comparative data set, The team had little to inform their risk management of patient's wheelchair stability.

Aim

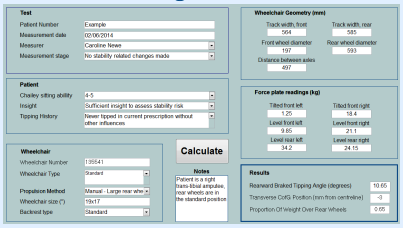
To enable the team to make clinical decisions relating to wheelchair stability based on numerical data

•Convenient, clear, robust measurement process

•Opportunity to compare results for individual patients with data for a relevant population

1. Measurement Process

Staff taking measurements



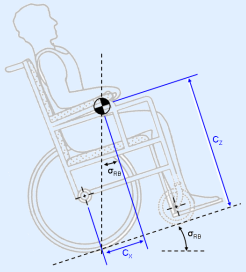
Data entry screen

Test definition

•A measurement fixture
•A standard operating procedure for measuring
•A system for recording and calculating results

Reducing variation

•The effect of variation in of our inputs on tipping angles:
  •1 SD geometry measurements: 0.1°
  •1 SD ground reaction forces: 0.1°
•Selected three metrics
  •Relevant to service
  •Most repeatable
•Trained 12 measurers



Rearward braked tipping angle

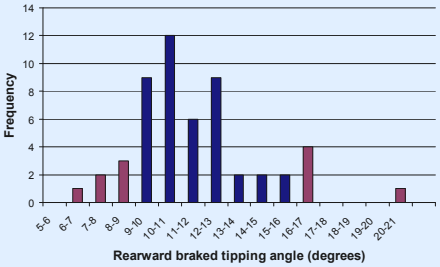
2. "Standard" patient data set

Rationale

•Relate clinic results to a known population: *"within the least stable 10% of our patient population" can be more useful than "8.5° rearward braked tipping angle".*
  •Clinician's decisions
  •Patient's understanding and acceptance of risk

Method

•We gathered data from our patient population, where the following criteria were met:
  •Basic manual wheelchair
  •Frame configuration within manufacturer's specification
  •Standard backrest (no hard or carved foam backrests)
  •No abnormal weight distribution (amputees or bariatric patients)



Distribution of standard configurations

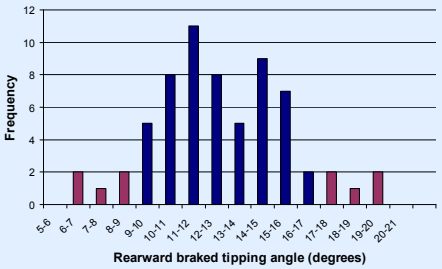
Results

•Highly unstable results (<9°):
  •3 x skilled users
  •3 x unsuitable configuration (wheelchair stability increased before leaving clinic)

•Highly stable results (>16°):
  •3 x users with ataxic movements
  •3 x unsuitable configuration (wheelchair reconfigured before leaving clinic)

•80% of results between 8.6 and 15.9°: guidance for prescribers

3. "Custom" patient data set



Distribution of custom configurations

Rationale

•Customisations effect wheelchair stability:
  •Non-standard seats
  •Extreme reconfigurations
  •Ventilators & suction units

•Essential to compromise between manoeuvrability and stability

•Standard equipment has a known safety record: Few tipping incidents, few reports of problems with manoeuvrability and pushing efficiency

•Useful to compare results for a patient using customised equipment to a known safe population

Method

•We compiled data from our patient population using the following criteria:
  •Non-tilting, manual wheelchair
  •Did not meet the criteria specified for "standard" wheelchairs

Results

•Highly unstable results (<9°):
  •1x skilled user
  •4x unsuitable prescription (wheelchair reconfigured before leaving clinic)

•Highly stable results (>17°):
  •3x complex additional equipment
  •2x unsuitable prescription (wheelchair reconfigured before leaving clinic)

Lessons

•Results were reasonably close to a normal distribution for both populations, with a few exceptions

•Simple prescriptions can result in excessively unstable or stable wheelchairs: potential requirement to monitor "seating" and "general wheelchair" patients

•We have reasons for our outliers, with some exceptions

Impact on service

•Improved risk management by clinicians and patients.

•Evidence that small variation in wheelchair configuration can significantly effect stability: potential requirement to monitor "seating" and "general wheelchair" patients.

•Guidelines for prescribers

Future work

Combining with propulsion efficiency work

•Comparison data set for powered wheelchairs

•More detailed guidelines for prescribers

owen.mills@ggc.scot.nhs.uk

WestMARC, Southern General Hospital, Glasgow