

Tell us about your idea/project:

The proposal of this innovation project is to purchase a digital gait analysis system – BTS G-walk - for orthotic treatment. Clinical gait analysis is essential for assessment and prescription of orthoses to patients who suffer from neuromusculoskeletal disorders and require an orthosis to improve function by controlling motion, reducing pain and providing support through gait stabilization (1).

Currently most Orthotists use observational gait analysis to perform the assessment. However there are studies which have already found that judgements based on observational gait analysis may be inaccurate, even for well-trained clinicians. (2,3)

BTS G-walk is a new digital gait analysis on the market and is able to accurately capture key information including spatio-temporal parameters, general walking kinematics and pelvis kinematics to assist Orthotists to choose the most suitable orthosis in treatment. BTS G-walk is composed of a small wireless inertial sensor which is connected to software in the computer for gait analysis. The sensor is placed around the patient's waist (5th lumbar vertebra) using a dedicated ergonomic belt that does not influence the execution; at the end of each trial, an automatic report is displayed showing the parameters analysed during the task.

Not only does it analyse gait during walking, BTS G-walk can also execute several other tests including timed up and go, turn test, 6 minutes walking test and indoor running; which enable Orthotists to determine patient's actual risk of fall as well as the ability to maintain balance whilst executing such variety of different movements.

BTS G-walk is proposed to be located at the Orthotic department at RNSH and will mostly be used by the Orthotists. The data obtained can also be utilized by MDT in this hospital.

Provide a case for change:

A 3D gait analysis laboratory is recognized as a gold standard, but requires equipment including optoelectronic cameras, tri-axial force platforms and surface EMG systems which costs tens of thousands and often takes a much longer time for the assessment. Furthermore, not all clinical cases require such detailed examination.

Observational gait analysis (OGA) is an almost no-cost option, but it has its disadvantages. OGA requires a great deal of training and practice to be able to identify gait abnormalities which may still be inaccurate. Orthotists, particularly for those with less experience often encounter difficulty in prescribing the most appropriate orthosis to patients or need to take much longer time in trial and error to make a correct decision due to lack of gait analysis data. An extended treatment time will significantly affect the waiting period for the out-patients on the waiting list. Furthermore, variation between clinicians is another disadvantage of observational gait analysis as it is quite subjective.

Using a BTS G-walk for the gait analysis in the Orthotic department will have the following benefits:

1. Low cost when compared to 3D gait analysis laboratory but able to capture useful digital data
2. Testing is not restricted to a laboratory environment and patient is able to walk relatively unrestricted as the inertial sensor is small. As a result, it will have less compliance issue to certain patients such as geriatric patients
3. Reduce the treatment time which results in shortening the out-patient waiting period
4. Minimize the inappropriate orthosis fitted to patient and reduce the potential injury
5. The gait analysis report can provide a formal permanent record and can be reviewed anytime
6. Utilising the report to clearly explain, communicate and visually demonstrate to patients what is occurring during the gait cycle
7. The gait analysis reports can be documented in EMR, which can be shared by all clinicians

Please list how you will implement the project:

Step 1 - quote already attained on 18/5/2018 by Derek Lee

Step 2 - acquisition of BTS G-walk within 2 months of project funding approval by Derek Lee and James Hui, Orthotic Manager

Step 3 - Installation of BTS software to existing computers after receiving the equipment by Derek Lee and ICT staff

Step 4 - In-service training will be provided to all Orthotist in Orthotic department within 1 month after receiving the equipment

Step 5 – first trial of BTS G-walk on patient within 2 months after receiving the equipment and all orthotist in Orthotic department will be involved

Step 6 – evaluation/Review of BTS G-walk will be conducted by orthotic team within 9 months of project funding approval

How will you measure/evaluate your project:

Key outcome 1: average out-patient assessment time

Compare the average time difference for the out-patient orthotic assessment (6 months prior to 6 months post using the BTS G-walk gait analysis system)

Key outcome 2: average out-patient waiting period

Compare the average waiting period for initial orthotic assessment (6 months prior to 6 months post using the BTS G-walk gait analysis system)

Key outcome 3: Review of BTS G-walk every 3 months

BTS G-walk will mostly be used by Orthotists in the Orthotic department if the project is approved. Orthotic department at RNSH is a very small department so meeting every 3 months to review the equipment is more efficient and effective than any survey or audit. Review can include application of data on patient's assessment, issues in using the equipment, etc.

Detail the cost:

The total cost for BTS G-walk is \$6970 which includes

Hardware – 1 x Wireless inertial sensor

1 x (Belt + extension

1 x transport bag

1 x Bluetooth dongle

1 x USB cable

Software – BTS G-Studio – 1 license = 5 users

Warranty – 12 months

Options – (1) BTS Secure/annual fee (Annual software subscription, free software updates and technical support (\$697)

(2) Warranty extension – 3 years (1 year included + 2 additional) (\$697)

Additional comments/references:

References:

1. Robert S. Lin. CPO. The application of gait analysis in Orthotics.

From http://www.oandplibrary.org/cpo/pdf/1985_03_036.pdf

2. Kawamura CM, de Moraes Filho MC, Barreto MM, de Paula Asa SK, Juliano Y, Novo NF. Comparison between visual and three-dimensional gait analysis in patients with spastic diplegic cerebral palsy. *Gait Posture*. (Comparative Study;). 2007 2007 Jan (Epub 2006 Jan;25(1):18-24.

3. Williams G, Morris ME, Schache A, McCrory P. Observational gait analysis in traumatic brain injury: accuracy of clinical judgment. *Gait Posture*. 2009;29(3):454-9