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Acceptability and practicality of pGALS in screening for Rheumatic Disease in Malawian children

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Paediatric clinical assessment, musculoskeletal examination, [low resourced](#) country, rheumatology

Abstract

Background: The pGALS (paediatric Gait, Arms, Legs, Spine) Musculoskeletal (MSK) screen is validated in English speaking school aged children and has been shown to be useful in acute paediatric practice in the UK.

Aims: To evaluate the practicality and acceptability of pGALS in children in an acute hospital setting in Malawi.

Methods: School-aged in-patients and children presenting to the Queen Elizabeth Hospital Blantyre, Malawi participated. Practicality (time taken, degree of completion) and patient / parent assessed acceptability (time take, discomfort) were assessed using a 'smiley face' visual analogue scale.

Results: Fifty-one children (median age 8 years) were assessed; 23/51 (45%) in the emergency department and the remainder were in-patients. Most presentations were infection or trauma related (n=35, 69%). Practicality of pGALS was good (median time to complete pGALS - 4 minutes (range 1.8-7.4), and completed in 48/51 children (94%). Acceptability was high; 98% parents considered the time taken to be acceptable, 84% of children deemed little / no additional discomfort. Abnormalities using pGALS were found in 21/51 (41%), mostly in the lower limbs.

Conclusions: The pGALS MSK screen was practical and acceptable in this acute setting. Abnormal findings were common.

Introduction

Improving outcomes for children with rheumatic disease in low and medium resourced countries is a major challenge. There is a paucity of data relating to rheumatic disease in children in such countries however, there are reports of delayed presentation and worse outcomes; with children in Nigeria with Juvenile Idiopathic Arthritis (JIA) presenting for the first time to rheumatology clinics a median of 3.7 years after disease onset ⁽¹⁾. In India, many children presenting to a paediatric rheumatology clinic had significant articular damage after mean disease duration of 5 years and patients with Systemic Lupus Erythematosus displayed higher mortality rates ⁽²⁾.

Delay in access to care for children with JIA is a major problem, likely a global issue with multi-factorial aetiology⁽¹⁻⁴⁾ including poor self rated confidence in MSK clinical assessment in doctors to whom children may present^(5,6) as a result of inadequate paediatric MSK clinical skills teaching at undergraduate and postgraduate level ⁽⁷⁻¹⁴⁾. The GALS (Gait, Arms, Legs, Spine) adult MSK screening examination has been taught to medical students throughout the UK and has been shown to improve the assessment of the MSK system in adults with rheumatic disease ^(15,16). A paediatric version of GALS (called pGALS) has been validated in school aged children ⁽¹⁷⁾ and is a simple and quick way to detect significant joint problems in children. It is aimed at the non-expert in paediatric rheumatology (e.g. medical students, primary care and general paediatricians as well as non medical health care professionals). pGALS has been shown to be practical, acceptable and helpful when performed by a non-expert in paediatric rheumatology in an acute paediatric setting ⁽¹⁸⁾.

Changes to medical curricula to include musculoskeletal (MSK) assessment is a key goal of the International League Against Rheumatism (ILAR); it is acknowledged that competent basic MSK assessment is important to facilitate earlier diagnosis and appropriate referral. The

aim of this study was to ascertain the practicality and acceptability of pGALS in an acute paediatric setting in Malawi using a translator. This information will inform teaching strategies to improve MSK clinical skills in Africa with the aim of facilitating earlier recognition of children with significant joint disease.

Methods

The paediatric department at Queen Elizabeth Central Hospital (QECH), Blantyre, Malawi sees 80,000 new patients, of which are 28,000 admitted, per year. Patients present directly to the accident and emergency department or are referred from health centres and other hospitals throughout Malawi. There are 300 inpatient beds, with up to 350-450 (in February even the time you did yr assessment if I remember well Eve) inpatients at any one time.

Over a two day period the study involved recruitment of all eligible in-patients and newly presenting children (aged between 4-16 years) who were deemed well enough (assessed by the parent / guardian and doctor) to undertake the pGALS examination. Children were excluded if they were attached to medical equipment (e.g. intravenous fluids) that would impair mobility. Informed consent was obtained from the parent / guardian and assent from older children (aged 8 or above), using information sheets and consent forms translated into Chichewa (Malawi's main official language) and explained by a Malawian translator. Children were assessed as per routine clinical practice by the clinician on-call and then the child and parent / carer were approached by the researcher (ES, an experienced UK trained general paediatric trainee) with the study explained by the translator. pGALS was performed by the same examiner (ES) throughout and the assessment did not interfere with routine clinical care.

The methods of this study are similar to those previously used by Goff et al, to assess use of pGALS in an acute general paediatric assessment in the UK ⁽¹⁸⁾. A proforma was used to

collect data including patient demographics, presenting complaint, final diagnosis (from case notes) and details of the pGALS examination (time taken, elements of examination completed / not completed, any abnormal findings detected and the responses to the three screening questions). If an MSK abnormality was detected the responsible consultant on call was informed. A 'smiley face' visual analogue scale ⁽²³⁾ was used to determine the acceptability of the examination to the child and parent in terms of time taken for the examination and the discomfort caused.

Statistical analysis used non-parametric tests with primary outcomes being the practicality (degree of completeness) and acceptability (time taken and level of discomfort associated with the examination). A power calculation on the basis of an estimate of completeness of the examination (95% confidence interval) with a maximum standard error of 7%, required 50 children to be included in the study. The study was approved by the University of Malawi, College of Medicine Research and Ethics Committee (COMREC no P.10/10/1004).

Results

All children / parents approached agreed to participate in the study. Fifty one children (60% male, 40% female, median age of 8, range 4-15 years) were included. The pGALS examination was completed in most children (48/51, 94%) - reason for non-completion; child being fractious (n=1), limb fracture (n=1), trauma related pain (n=1) (see Table 1).

All study participants completed the acceptability questionnaire; 98% of parents deemed the length of time taken by the examination to be acceptable (Figure 2), with the median time taken to complete pGALS being 4 minutes (range 1.8 to 7.4). There was not a significant association between the degree of discomfort / age of the child and the time taken for examination (data not shown). The duration of the pGALS examination was 1.8-6.5 minutes (mean 3.9 minutes) in those with a normal examination compared to a. 3-7.43 minutes (mean

4.8 minutes) in those with an abnormal pGALS assessment (difference in duration of examination not statistically significant, $p = 0.49$). Most (84%) children found the examination to cause little or no discomfort (Figure 2). Of the seven patients who reported discomfort with the pGALS examination, four had evidence of MSK abnormalities (reduced range of movement due to previous trauma or local soft tissue infection).

Many (21/51, 41%) of the children had an abnormal pGALS examination of whom 8/21 (38%) had evidence of confirmed MSK diagnoses including hypermobility, trauma, joint infection and spinal deformity. The remaining abnormal pGALS assessments were mainly accounted for by neurological problems, local or systemic infections and soft tissue injury (Table 2). 12/21 (57%) children with an abnormal pGALS screen reported MSK symptoms at presentation. The commonest components of the pGALS screen to be abnormal were the gait and legs (Table 2).

Half of the patients assessed (26/51, 50%) had infection related diagnoses and presenting complaints (detailed in Figure 1). Many (23/51, 45%) were assessed in accident and emergency (A&E) and the remainder (28/51, 55%) assessed as in-patients. The groups were similar with regard to the proportion with infection related diagnoses (43% in each group) and medical diagnoses (36% A&E, 30% inpatient group). Orthopaedic problems were more common in A&E (23% A&E, 7% inpatient group). Abnormalities on pGALS assessment were more common in the inpatient group (13/28, 46%) compared with the A&E group (9/23, 39%). Furthermore, individual inpatients tended to have more abnormalities detected on pGALS examination and A&E patients mostly had a single abnormality e.g. abnormal gait / limp (detailed in Table 3).

The three screening questions in pGALS ask about pain in the joints, muscles or back and any difficulty with dressing or stairs. Of the 20/51 (41%) children who answered 'yes' to 1 or

more questions, 12/20 (60%) had abnormal findings on pGALS examination. Pain was the symptom mentioned by the 8 children who subsequently were found to have a normal pGALS examination. Nine children who answered 'no' to the pGALS screening questions had abnormal findings on pGALS examination (previous trauma to arm and hip n=2, hypermobility n=4, foot drop associated with neurological pathology n=1, reduced temporomandibular (TMJ) joint movement in a patient with a parotid abscess and small bilateral knee effusions in a patient following drainage of a brain abscess. In this series a positive result to $\geq$ one screening question gave the following validity against the pGALS examination findings being abnormal: sensitivity 57%, specificity 63%, positive predictive value 60% and negative predictive value of 67%. Of the three pGALS questions, enquiry about pain was most sensitive in identifying children with MSK (38%), with difficulty dressing (14%) and climbing stairs (5%) being less helpful.

Discussion

This study demonstrates that the pGALS MSK screening tool is practical, acceptable and informative in this acute setting despite many children having significant trauma (fractures of the ankle, tibia, wrist, dog bites), serious infections (e.g. malaria, TB meningitis, pneumonia), serious medical conditions (e.g. cardiomyopathy, nephrotic syndrome, stroke) and considerable co-morbidities (e.g. HIV, TB, malnutrition). Undertaking the study over two consecutive days resulted in a high recruitment and we believe this is representative of the normal case-load of the QECH paediatric department. All the children / parents approached were willing to participate but it is likely that there was selection bias towards less unwell patients.

The researcher performing pGALS in this study (ES) is an experienced general paediatric trainee (ST4 of UK general paediatric training - www.rcpch.ac.uk) with no prior postgraduate

training in paediatric rheumatology or orthopaedics. Her training in pGALS was similar to that of medical students at Newcastle University, namely exposure to a DVD demonstration of pGALS performed on a normal child (http://www.arthritisresearchuk.org/arthritis_information/information_for_medical_profes/pgals_video.aspx)⁽²⁰⁾ and being observed performing pGALS on children in an outpatient clinic. Her competence in the performance of pGALS has not been formally assessed and the findings observed in the study were not validated by a paediatric rheumatologist or paediatric orthopaedic surgeon. However, the purpose of the study was to not to assess validity of pGALS but did demonstrate that pGALS was acceptable and practical to perform in this setting. The time taken to perform pGALS was longer than that reported for a consultant paediatric rheumatologist⁽²¹⁾, but given the need for a translator and the acute setting, the time is very comparable to other studies involving non paediatric MSK specialists (i.e. a primary care doctors in acute paediatric practice (median 3 minutes)⁽¹⁸⁾ and a medical student (median 4.75 minutes)⁽²²⁾. Abnormalities on the pGALS screen were commonly found, especially in children who were inpatients. Many of the abnormalities on the pGALS screen were accounted for by non-MSK disease and this emphasises the need to consider the findings in the context of the clinical presentation. Notably many children were deemed hypermobile – it is acknowledged that variation in joint ranges of movement does occur with age and ethnicity, and again findings must be interpreted in the clinical context and with knowledge of normal development, normal variants and milestones.

The validity of the three pGALS screening questions was lower than reported in previous studies^(18, 22). This may be partly explained by the use of a translator but we suggest it is more likely due to the questions not being relevant to the lives of children in Malawi – namely most homes are on the ground floor and so climbing stairs is not a regular occurrence and furthermore for many children dressing and undressing is less likely to be a problem as

they may not have or wear many clothes. It is known that MSK history taking per se may not localise significant joint problems in children (Goff BSR 2010, paper in preparation) highlighting the need for a screening examination especially in young children who may not vocalise or localise symptoms. In clinical skills teaching however, inclusion of the pGALS screening questions is recommended as a prompt for MSK assessment to be included. This aide memoire is especially important when taking a history through an interpreter as this often relies on specifically excluding certain symptoms and conditions, with subtle points often being lost in translation. It is clear however that the screening questions need to be relevant to the child's environment; in Malawi it may have been more appropriate to enquire about the ability of the child to pick up and carry a heavy object on their head or use local tools.

Verbal feedback from parents regarding the study was very positive with most parents being keen for their child to be examined as thoroughly as possible whilst in hospital. Many patients had had to travel for hours and sometimes even days by foot, minibus or truck and were appreciative of having a comprehensive examination. Many of the parents commented on having their own MSK symptoms and sought help for themselves.

Awareness of rheumatic diseases in childhood in many low or medium resourced countries is lacking, with poor long term outcomes resulting from late or inaccurate diagnosis, lack of appropriate resources, poor access to treatments and inadequate health service infrastructure for chronic disease management ^(1,2,23-4). Furthermore tropical infections and the burden of malaria, TB and HIV infection make diagnosis and treatment complex. The WHO-ILAR COPCORD Programme, designed to explore the feasibility of 'rheumatic disease prevention and control in the community' describes high prevalence of MSK pain in adults in COPCORD, similar to that of Western studies highlighting the global nature of rheumatic complaints and disability ⁽¹⁹⁾. However, the paucity of specialists is apparent and there is

currently no rheumatologist in Malawi (paediatric or adult) and in sub-Saharan Africa as a whole (excluding South Africa) it has been quoted that there are less than 20 rheumatologists serving 800 million people ⁽²³⁾.

This study demonstrates that pGALS is practical, acceptable and a useful clinical skill to be incorporated into regular paediatric practice and may help facilitate earlier diagnosis of rheumatic disease in children although findings be interpreted in the clinical context. pGALS is aimed for use by the non expert in paediatric MSK disease and could be taught to health care workers to facilitate triage and referral with the ultimate aim of improving outcomes. We demonstrate that the use of pGALS in developing countries needs to account for language and cultural differences necessitating need of translators or modified screening questions that are relevant to patient populations. The 'East Africa Initiative' (funded by ILAR) aims to unite the international rheumatology community to aid in the enhancement of clinical rheumatology services ⁽²⁴⁾ and we believe that pGALS could be a useful adjunct to strategies to improve outcomes for children with rheumatic disease in developing countries.

Table 1: Completion of pGALS and abnormal findings encountered

The components of the pGALS screen	Completed - n (%)	Abnormal responses - n (%)
Screening questions		
Do you / does your child have any pain or stiffness in your joints, muscles or back?	51 (100%)	14 (27%)
Do you / does your child have any difficulty getting yourself dressed without any help?	51 (100%)	5 (10%)
Do you / does your child have any difficulty going up and down stairs?	51 (100%)	3 (6%)
	Children completing the manoeuvre - n (%)	Children with abnormal findings - n (%)
Gait		
Observe the child walking.	48 (94%)	6 (12%)
“Walk on your tip-toes”	48 (94%)	8 (16%)
“Walk on your heels”	48 (94%)	8 (16%)
Arms		
“Put your hands out in front of you”	48 (94%)	1 (2%)
“Turn your hands over and make a fist”	49 (96%)	1 (2%)
“Pinch your index finger and thumb together”	48 (94%)	4 (8%)
“Touch the tips of your fingers with your thumb”	48 (94%)	4 (8%)
Squeeze metacarpophalangeal joints	51 (100%)	1 (2%)
“Put your hands together/put your hands back to back”	49 (96%)	2 (4%)

“Reach up and touch the sky”	49 (96%)	4 (8%)
“Look up at the ceiling”	50 (98%)	0
“Put your hands behind your neck”	50 (98%)	0
Legs		
Feel for effusion at the knee	51 (100%)	1 (2%)
“Bend and then straighten your knee” (active movement of knees and examiner feels for crepitus)	50 (98%)	3 (6%)
Passive flexion (90 degrees) with internal rotation of the hip	51 (100%)	1 (2%)
Spine		
“Open your mouth and put 3 of your fingers in your mouth”	49 (96%)	2 (4%)
Lateral flexion of the spine: “Try and touch your shoulder with your ear	49 (96%)	0
Observe spine from behind	51 (100%)	1 (2%)
“Can you bend and touch your toes” observe curve of spine from side and behind.	49 (96%)	2 (4%)

Figure 1: Presenting diagnoses

***46% of children with infection had Malaria, 11% had Tuberculosis. Other infections included upper respiratory tract infections, pneumonia, abscess, cellulitis, and tinea capitis.**

**** Other medical diagnoses included nephrotic syndrome, cardiomyopathy, diabetes, pancytopenia, stroke, ascites, malnutrition and presentation with splenomegaly.**

***** Surgical diagnoses included rectovaginal fistula and testicular mass.**

****** Orthopaedic diagnoses included trauma, animal bite, head injury and an ossifying lesion of the maxilla.**

Figure 2: Acceptability of pGALS

Table 2: Patients with an abnormal pGALS assessment

Presenting complaint	Component affected	Examination findings on pGALS screen	Musculoskeletal diagnosis
Patients with abnormal pGALS due to MSK disease			
Fall and painful right wrist	Wrist	Pain, restricted movement.	Fractured wrist
Abnormal gait and posture	Spine, gait	Abnormal gait. Abnormal appearance of the spine. Restricted forward flexion of spine.	TB spine
Limp	Gait, knee	Abnormal gait.	Proximal tibial fracture (new)
	Gait, ankle	Abnormal gait. Ankle swelling.	Fractured ankle
Fever, vomiting, abdominal pain,	Knees, elbows, wrists, arches of feet	Pain, hypermobility of joints, loss of foot arches	Malaria, arthralgia, Hypermobility

Headache	Hip	Restricted movement	Malaria + previous hip trauma
Dog bite	Elbow	Restricted movement	Previous fracture with mal-union
Ascites	Knees, elbows, wrists, arches of feet	Hypermobility of joints, loss of foot arches	Hypermobility
Patients with abnormal pGALS due to non-MSK disease			
Fever, vomiting, abdominal pain, headache	Gait	Unable to walk on heels or toes	Malaria, weakness
	Gait	Foot drop, unable to walk on heels	Cerebral malaria
Limp	Gait, toe	Abnormal gait	Cellulitis
Limp	Right leg	Abnormal gait	Thigh abscess
TB meningitis	Gait, dexterity of hands, spine	Abnormal gait. Inability to flex forwards at spine. Poor hand dexterity.	TB meningitis
Stroke	Gait	Abnormal gait	Stroke
Parotid swelling	TMJ	Pain, restricted movement	Parotid abscess
Brain abscess (post surgical drainage)	Knees TMJs	Swelling bilaterally. Restricted movement of jaw	Neurological, immobility
Malnutrition / kwashiokor	Wrist	Restricted wrist movement	Displaced IV cannula
Head injury	Knee Gait	Painful knee. Abnormal gait.	Soft tissue trauma
Headache	Knees, elbows, wrists, arches of feet	Hypermobility of joints, loss of foot arches	Tension headache

Cough, pyrexia	Knees, elbows, wrists, arches of feet	Hypermobility of joints, loss of foot arches	Pneumonia
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Table 3: Abnormal pGALS results in A&E patients vs. inpatients

Components of the pGALS screen	Frequency of abnormal component in A&E patients with an abnormal pGALS (n/9, %)	Frequency of abnormal component in inpatients with an abnormal pGALS (n/13, %)
Gait	2/9 (22%)	7 /13(54%)
Arms	3/9 (33%)	5/13 (38%)
Legs	5/9 (55%)	4/13 (31%)
Spine	2/9 (22%)	4/13 (31%)
TMJs*	0	2/13 (15%)

***Temporomandibular joints**

List of abbreviations

A&E – Accident and Emergency

BSR – British Society of Rheumatology

COPCORD – Community Orientated Programme for the Control Of Rheumatic Diseases

GALS – Gait, Arms, Legs and Spine

HIV – Human Immunodeficiency Virus

ILAR – International League Against Rheumatism

IV - intravenous

JIA – Juvenile Idiopathic Arthritis

MSK - musculoskeletal

pGALS – paediatric Gait, Arms, Legs and Spine

QECH – Queen Elizabeth Central Hospital

SLE – Systemic Lupus Erythmatosus

TB - Tuberculosis

TMJ – Temporomandibular Joint

WHO – World Health Organisation

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