The Gait, Arms, Legs and Spine (GALS) Locomotor Screen Teaching–Learning Package: Has it Achieved its Intended Learning Outcome?

Michael L. Tee[1] and Jose Alvin P. Mojica[2,3]

[1]*Section of Rheumatology, Department of Medicine, College of Medicine and Philippine General Hospital, University of the Philippines Manila*
[2]*Department of Rehabilitation Medicine, College of Medicine and Philippine General Hospital, University of the Philippines Manila*
[3]*National Teacher Training Center for the Health Professions, University of the Philippines Manila*

ABSTRACT

Introduction. Clinicians rarely screen their patients for musculoskeletal disorders during routine physical examination. Reasons vary, but inadequate teaching of musculoskeletal medicine is cited as a major factor. To address the above issue, the Section of Rheumatology, Department of Medicine, College of Medicine, and Philippine General Hospital, University of the Philippines Manila recently adopted the Gait, Arms, Legs and Spine Locomotor Screen (GALS) as the central focus of instruction for musculoskeletal conditions.

Objectives. A total of 189 medical interns participated in this descriptive study to determine whether GALS is deemed useful and can be readily applied in the outpatient clinics.

Methods. Data was gathered using a questionnaire, key informant interviews, and chart review. The data was analyzed using measures of central tendency, percentages and qualitative evaluation.

Results. Only 26% claimed to routinely perform the musculoskeletal screening examination and only 21% claimed they used the GALS technique. The medical interns emphasized that they were adequately taught to perform the GALS technique but felt that the routine use of GALS was time consuming. Emphasis on musculoskeletal screening was done only during clinical rotations in specialties like rheumatology, rehabilitation medicine or orthopedics, but not in other specialties. In addition, only the Section of Rheumatology used the GALS technique.

Conclusion. The findings of this study suggest that while medical interns feel competent in performing the GALS technique, its application in the clinics leaves much room for emphasis and that there is a need to standardize instruction on musculoskeletal screening.

Key Words: GALS, locomotor screen, learning outcome

Introduction

For physicians, skills in gathering medical history and performing physical examination are essential in establishing accurate medical diagnoses. To avoid missing potentially important findings, basic screening questions and physical examinations must be routinely performed. Abnormal findings should then lead to more detailed examinations. Despite the lack of any requirement for an instrument to perform a musculoskeletal examination, this area is often neglected in clinical practice. In 1990, Doherty et al. noted that only 14.5% of hospital notes recorded positive locomotor symptoms and signs, and only 5.5% recorded negative locomotor symptoms and signs.[1] Locomotor examination compared poorly with recorded examination of the cardiovascular system (100%), respiratory system (99.5%), and abdomen (99%).

Musculoskeletal disorders such as back pain, osteoarthritis, soft tissue rheumatism and inflammatory arthritides are the most common causes of severe long-term pain and physical disability, affecting hundreds of millions of people around the world. The Center for Disease Control claimed that arthritis is, in fact, the leading cause of disability.[2] With the aging of our population, joint diseases become especially more significant, accounting for half of all chronic conditions in persons aged 65 and over.[3]

In the Philippines, a study conducted in a rural community revealed that disability, including an inability to carry loads, affected nearly 1.8% of the population.[4] On the

Presented as poster at the 5th Asia Pacific Medical Education Conference (APMEC), January 24-27, 2008, in Singapore, and as e-poster at the 13th Congress of the Asia Pacific League of Associations for Rheumatology (APLAR) Pacifico on September 23-27, 2008, in Yokohama, Japan.

Presented as poster at the First International Conference on Education in the Health Sciences (ICE-HS) on October 1-3, 2008, UPMASA-Science Hall, Philippine General Hospital, Manila.

Corresponding author: Michael L. Tee, MD, MHPEd
Section of Rheumatology
Department of Medicine
Philippine General Hospital
University of the Philippines Manila
Taft Avenue, Ermita, Manila Philippines 1000
Telephone: +632 5261722
Email: michaelltee@yahoo.com

other hand, 16.3% of the urban population complained of musculoskeletal conditions. The prevalence of rheumatic disease is 9.8%. The prevalence of osteoarthritis (OA) was 4.1% and soft tissue rheumatism 3.8%.[5]

Despite the high prevalence of musculoskeletal diseases in the population, the medical curriculum barely deals with the subject.[6] As early as 1993, Morrison noted that the teaching of musculoskeletal medicine is not adequate.[7] Sadly, if students do not acquire skills and confidence in this area, their future practice will be adversely affected, and their patients with locomotor complaints will receive suboptimal treatment. In fact, Doherty et al. noted that this omission resulted in 92% of rheumatic lesions being overlooked. Treatment of symptomatic patients was missed or considered inadequate in 94%.[1]

Plant et al. validated the Gait, Arms, Legs and Spine (GALS) locomotor screen as a reliable and valid measure of functional ability.[8] This validated screening examination was initially designed for routine use in primary care and was intended to be a simple examination tool to aid in detecting important musculoskeletal abnormalities.

Using GALS, a two-stage approach to the examination of the musculoskeletal system was developed. The first stage is a screening examination, which distinguishes normality from abnormality, and localizes the presence of an abnormality to a region of the body. The second stage, if necessary, is a more detailed regional examination of an abnormality discovered.

In 2002, the Section of Rheumatology (Rheuma) of the Department of Medicine, University of the Philippines College of Medicine (UPCM) and Philippine General Hospital (PGH), adopted the GALS locomotor screen as the central strategy for teaching Year Level IV (YL IV) students, equivalent to second year medicine proper students. It was expected that the GALS teaching–learning package would provide students with "a mental and neural state of readiness, organized through experience" that would promote routine musculoskeletal screening in their clinical encounters with patients.[9] A four-component teaching-learning module was utilized to ensure the achievement of intended learning outcomes: 1) lectures; 2) a video presentation; 3) a self-instructional module; and 4) small group sessions with demonstration–return demonstration activities. The four-component GALS teaching and learning module was expected to be a more effective way of teaching musculoskeletal examination. Competency evaluation was done through objective structured clinical examination (OSCE).

Considering that all of the students passed the OSCE, they were expected to routinely utilize GALS in the clinics. This is especially true in the Department of Medicine where adequate opportunity to practice and apply this new set of skills is available at the outpatient clinics and medical wards.

Objectives

This study aims to determine whether the GALS teaching–learning package is deemed useful and can be readily applied in the outpatient clinics. Specifically, the objectives of the study are to:

1. Determine the proportion of medical interns at the UPCM Department of Medicine who perform musculoskeletal assessment (history and examination) among outpatients;
2. Ascertain the proportion of students who use the GALS locomotor screen method when they examine the musculoskeletal system;
4. State the situations during which the students apply their GALS skill in their patient encounter;
5. Determine which of the GALS teaching–learning methods utilized in the students' YL IV class proved to be most effective; and
6. Elucidate the students' perception of the GALS as a component of the clinical encounter.

Methods

Study Design

This study is a descriptive, qualitative and quantitative cross-sectional study.

Technical and Ethical Review

The National Teacher Training Center for the Health Professions approved the study after a thorough technical and ethical review.

Study Population

Year Level VII (YL VII) students, equivalent to medical interns, of the UP College of Medicine for academic years (AY) 2005–2006 and 2006–2007 who underwent the revised preclinical education that includes the GALS teaching–learning process provided by the Section of Rheumatology during their YL IV physical diagnosis class were included in the study. These students passed the objective structured clinical examination given prior to their promotion to YL V.

Data Gathering Procedure

Questionnaire

The YL VII students for AY 2005–2006 who were rotating at the Department of Medicine Outpatient Clinic from February to April 2006 and the YL VII students for AY 2006–2007 who attended the hospital orientation for interns were surveyed using a questionnaire to determine if they perform musculoskeletal screening examination as a clinical routine. The students were also asked whether they used the GALS technique on the occasions that they performed musculoskeletal history-taking and physical examination. The students were also asked to rate their

confidence in performing the GALS screen on a scale of 1 to 4, with 4 representing the highest confidence.

The AY 2005–2006 students were also asked to assess the quality of musculoskeletal education that was delivered using the four teaching–learning methods included in the GALS package, namely: lecture, video presentation, printed hand-out and small group demonstration–return demonstration. In particular, each student was asked five questions regarding the quality of teaching and resources for the various components of the GALS teaching–learning package introduced to them during their YL IV classes. The questions related to: 1) the quality of information; 2) the relevance to clinical practice; 3) the organization; 4) the understandability; and 5) the appropriateness of content.

A global assessment of the usefulness of the individual strategy was also recorded. Finally, students were interviewed in groups to assess their confidence in examining the musculoskeletal system and explore their attitudes towards the screening for musculoskeletal problems.

Chart Review

Charts of charity outpatients of the Department of Medicine accomplished by AY 2005–2006 students were reviewed using the Chart Review Checklist developed for the purpose of ascertaining the proportion of students who used the GALS locomotor screen.

Key Informant Group Interview

Year level VII students were gathered for a key informant group interviews to share their views about routinely screening their patients' musculoskeletal systems for musculoskeletal conditions. They were asked for their reason(s) for the routine performance or non-performance of the musculoskeletal screen. They were also asked to give feedback on the educational effect of the individual GALS locomotor screen teaching–learning processes on their clinical history-taking and physical examination routine. They were also asked for their reason(s) for using or not using the GALS screen as the base technique for their musculoskeletal screening procedure. The students were asked to identify key areas where opportunities for teacher–student encounters may be modified to ensure more effective delivery of instruction.

Data Analysis

Data were analyzed quantitatively and qualitatively. The proportion of students who reported that they performed GALS as part of their routine clinical encounter procedure was determined. The proportion of charts reviewed which included screening history and physical examination of the musculoskeletal region was also determined. The structured students' rating of the four (4) teaching–learning components as to their presentation, relevance, organization, understandability and appropriateness to their level of training were quantitatively described. The weighted mean score was analyzed as follows:

$$\text{weighted mean score} = \frac{\Sigma(\text{score} \times \text{frequency})}{n}$$

where:

score = rating of 1, 2, 3, 4, 5
frequency = number of respondents who scored
n = total number of respondents

For the ratings with a five-point scale, 5 means excellent, 4 is good, 3 is average, 2 is fair and 1 is poor.

The preference for a specific component method was determined by the percentage of students who chose a particular teaching–learning technique as the most effective. Secondary outcome measures included the perceptions of the students on the effectiveness of each of the program's components gathered through the key informant group interviews.

Reasons for the performance and non-performance of musculoskeletal screen, including the use of GALS technique, were listed.

Results

Routine use of GALS

A total of 189 students answered the questionnaire, stating whether they performed musculoskeletal examination as part of their routine clinical encounter with patients (Table 1). Of these, only 26% reported that they performed musculoskeletal examination in the clinics, while only 21% claimed they used the GALS method in their clinical practice. The students were confident that they could perform GALS as they presented with an average confidence rating of 3.013/4.00.

Table 1. Students' self report of performing musculoskeletal (MSK) examination in clinical setting

Student Performance of MSK Examination	N=189	Percent (%)
Routine	50	26%
Not routine	139	74%
Use GALS screen method	40	21%
Does not use GALS screen method	149	79%

Chart review: student utilization of the GALS in the clinics

A review of 167 charts of new patients in the outpatient clinic of the Department of Medicine, filled in by the respondents, revealed that 42.51% asked patients about at least one symptom of musculoskeletal complaint ("ever asked"), while 39.52% examined patients for at least one sign

of musculoskeletal disorder as part of the routine clinical encounter ("ever examined") (Table 2).

Questionnaire: student evaluation of the individual components of the GALS locomotor screen teaching–learning package

All of the 189 students gave a global rating for the four components of the GALS (Table 3). The demonstration–return demonstration technique proved to be most acceptable to students with a preference rating of 87.37%. This was followed by the lecture, hand-out and video presentation with a preference rating of 5.80%, 3.16% and 2.63%, respectively.

Table 2. Student utilization of the GALS locomotor screen examination in the evaluation of patients at the Department of Medicine Outpatient Clinic based on chart review

Chart Review on GALS Utilization	Total	Percent (%)
History		
1. Asked whether patient suffers from pain	63	37.72%
2. Asked for swelling of joint	18	10.78%
3. Asked about difficulty in washing or dressing	4	2.40%
4. Asked about difficulty in going up or down stairs	12	7.18%
Ever asked	**71**	**42.51%**
Physical Examination		
1. Described the gait, or whether the patient is ambulatory	43	26 .95%
2. Noted spine deformity or normal condition	6	3.59%
3. Noted upper extremity deformity or normal condition	12	7.18%
4. Noted lower extremity deformity or normal condition	28	16.77%
Ever examined	**66**	**39.52%**

Table 3. Student preference global rating of the four (4) components of the GALS Locomotor Screen Teaching–Learning Package

Student Preference Rating of Teaching Method	Percent (%)
Demonstration-return demonstration	87.37%
Lecture	5.80%
Handout	3.16%
Video	2.63%

The preference rating was consistent with the results of the structured rating of each individual component of the GALS using the structured questionnaire accomplished by 31 students rotating in the Department of Medicine at the time of the chart review process. Small group demonstration–return demonstration activities showed a rating of 19.58 out of a possible score of 25. This was followed by the lecture, hand-out and video with ratings of 14.58, 10.81 and 9.71, respectively (Table 4).

Table 4. Student rating of the four (4) components of the GALS Locomotor Screen Teaching-Learning Package using a 5-point rating scale

Criteria	Rating*			
	Lecture	Video	Hand-out	Demonstration
Presentation	2.90	1.90	2.22	3.94
Relevance to Clinical Practice	3.00	2.00	2.26	4.03
Organization	2.94	1.97	2.13	3.87
Understandability	2.87	1.94	2.10	3.87
Appropriateness	2.87	1.90	2.10	3.87
Weighted Mean Rating	**14.58**	**9.71**	**10.81**	**19.58**

** 5 = excellent, 4 = good, 3 = average, 2 = fair and 1 = poor.*

Key informant group interviews

The qualitative research study was undertaken via key informant group interviews. Seven key informant groups were formed involving five to six medical interns rotating in the outpatient clinic of the Department of Medicine. The general feeling was that musculoskeletal examination is an important but time-consuming activity. For this reason, students did not include this in the routine physical examination. Students felt that there were too many areas to examine in a routine GALS screen. According to the students, the patients had difficulty understanding instructions, preventing them from performing the screening examination adequately. Performing GALS was viewed as too time-consuming and lengthy. In addition, musculoskeletal complaints were viewed as a common consequence of aging, with nothing much can really be done about them.

Not surprisingly, the attitude of clinical instructors also affected the students' view of the system. Students tended to skip the parts of the screen that clinical instructors seldom focused on when they evaluated the charts and reports. As one student claimed, "*hindi naman hahanapin ng preceptor o resident yan*" (the preceptors or residents will not look for them anyway). In addition, even residents and fellows themselves, with whom the students interact with during their clinical exposure, did not routinely document musculoskeletal screening on their patients' medical charts. The students noticed that only the specialists interested in the care and treatment of patients with musculoskeletal conditions paid attention to the musculoskeletal system while almost all the other body systems were routinely examined or screened by almost all physicians.

The students also observed that even in the fields related to the musculoskeletal system, specialists use varying techniques for musculoskeletal examination.

Despite the seeming lack of interest in using the GALS screen, students reported that they still performed regional musculoskeletal examinations as the need arose. There was an increased tendency to use the GALS screen when they rotated in departments that focus on musculoskeletal disorders such as Orthopedics and Rehabilitation Medicine.

Discussion

Failure to properly screen for musculoskeletal conditions may lead to inadequate treatment or, worse, non-treatment. This is particularly dangerous as the population ages and health workers or providers begin to dismiss commonly seen musculoskeletal conditions as a "normal" part of aging.

The need to re-emphasize a standardized technique for musculoskeletal evaluation led to the development of a set of core learning outcomes for an undergraduate medical curriculum. This set was formulated after extensive, worldwide consultation with experts in orthopedics, rheumatology, and rehabilitation medicine. An integral component of this curriculum is the acquisition of basic skills to assess and diagnose musculoskeletal problems. To this end, the GALS locomotor screen was developed, evaluated and was found to improve student performance of musculoskeletal examination as determined by an objective structured clinical examination at the end of the course.[10]

Good Cognition and Skill, Inadequate Attitude

In UPCM, students were very confident ($\bar{x}$ = 3.013/4.00) that they could adequately perform a musculoskeletal system screening examination. The high confidence rating is not at all surprising as these students passed the YL IV OSCE in the Department of Medicine that included the GALS screen. However, only 21% stated that they used the GALS technique. This finding reflects poorly on the impact of the GALS screen teaching–learning package in influencing a significant change in the attitude of students towards the subject. As stated previously in the group interview, the students knew how to perform a complete musculoskeletal screen but they perceived that their findings would not have much impact on their patients' management.

It has been established that the attitudes of individuals shift with their perceptions of how most of the members of their group react to a particular attitude object.[11] For while students are generally not punished for not doing the GALS screen, neither are they rewarded for doing it. Good feedback is crucial in guiding and affirming students' "theories of action".

The absence of reinforcement in the form of reminders from consultants or preceptors has led students to consider the musculoskeletal system locomotor screen non-routine. The lack of corrected repetition in clinical training is probably among the underlying causes of poor skills application in this area.

Lack of standardization

The lack of a standard in the performance of the GALS screen among the three (3) specialty groups associated with the musculoskeletal system can cause confusion among students. Considering that the patients seen by the specialists have musculoskeletal disorders, students are immediately exposed to a detailed regional examination that is at best comprehensive and at worst too focused on the affected region. The best hope for a standardized application of the GALS screen would have been in the outpatient clinics of the Department of Medicine, and the Department of Family and Community Medicine. However, it should be noted that even in the Department of Medicine, medical students are not adequately provided with informative experiences to develop a correct attitude towards the GALS screen. It is noteworthy that the key informants focused on the Department of Medicine when they made the aforementioned comments. Furthermore, when these students rotate in the other specialties such as Rehabilitation Medicine and Orthopedics, they are taught different ways of performing a musculoskeletal screen. This leads to further confusion, thereby negatively affecting the development of proper attitude towards the GALS screen.

The results of the chart review are consistent with the survey. Except for asking for the presence of pain, the components of the GALS screen were noted in less than 30% of the charts reviewed. Even the cursory examination of the gait is only documented as "ambulatory" in almost all the charts. Very minimal attempt to characterize the gait was observed. Screening questions that relate to musculoskeletal functional capacity was noted in less than 10% of the charts. This is in stark contrast with the evaluation of cardio-pulmonary functional capacity that was observed in most of the charts reviewed.

Demonstration-return demonstration deemed most effective

The results of this paper are consistent with the principles outlined by Dacre and Fox which state that deep learning among adult learners may be enhanced through reduced didactics, and by increasing small group and self-directed learning.[12] Small group exercises that permitted skills demonstrations and return demonstrations proved to be the most acceptable way of teaching the GALS screen, getting a 19.58 weighted mean rating. The lecture and video presentation placed the whole concept of the GALS screen in the broad perspective of physical examination and clinical diagnosis. The hand-out provided an informal performance checklist that served as the students' learning guide. These components reinforced the knowledge of the students as they proceeded to the final teaching–learning process of small group demonstration–return demonstration.

While a standardized skills laboratory is not available for the purpose of teaching the GALS screen, the preceptors underwent a standardization session to ensure uniformity in the demonstration of pertinent clinical skills.

Conclusion and Recommendations

While students gained much in terms of cognitive and skill components during their YL IV GALS screen teaching

and learning process, it was established that the same students did not fully apply these skills in the clinics. The introduction of a multi-pronged approach to instruction that particularly focuses on the GALS screen did not impact on the subsequent clinical practice of students. This paper affirms that in clinical skills instruction, small group demonstration–return demonstration still provides the best opportunity for the teachers to ensure transfer of learning to students. However, this alone will not suffice as the skills will decay over time unless adequate reinforcement in the form of feedback and skills- or concepts-appreciation activities are conducted.

It is recommended that a standardization session among all faculty members involved in teaching conditions of the musculoskeletal system be conducted. It is further recommended that the GALS locomotor screen be used as a central focus of instruction, as it has been validated following multi-specialty consultation. This is an effective way of hurdling a major barrier to the delivery of effective clinical teaching, specifically the lack of agreement on what to teach.[13] The use of the GALS screen for faculty standardization may increase the confidence of non-musculoskeletal specialists when they handle small group demonstration–return demonstration sessions.

To counter the students' view that musculoskeletal diseases are "common consequence of aging and nothing much can really be done about them," it might help if lectures start emphasizing the impact of these conditions on younger patients. Lectures on recently developed treatment options, including the use of biological drugs may also allow the students to appreciate the value of early diagnosis in preventing long-term disability among these patients.

Finally, in the move towards giving the musculoskeletal system the attention it deserves, clinical instructors should be re-educated and re-oriented on the use of the GALS locomotor screen. Residents and fellows who act as surrogate clinical instructors should also be included in the effort to ensure that students get a uniform and consistent message on the importance of the musculoskeletal screen.

References

1. Doherty M, Abawi J, Pattrick M. Audit of medical inpatient examination: a cry from the joint. J R Coll Physicians Lond. 1990;24(2):115-8.
2. Center for Disease Control. MMWR Morbidity Mortality Weekly Report. 2001;50:120-5.
3. Woolf AD, Walsh NE, Akesson K. Global core recommendations for a musculoskeletal undergraduate curriculum. Ann Rheum Dis. 2004;63(5):517-24.
4. Wigley R, Manahan L, Muirden KD, et al. Rheumatic disease in a Philippine village II: A WHO-ILAR-APLAR COPCORD study, phases II and III. Rheumatol Int. 1991;11(4-5):157-61.
5. Dans LF, Tankeh-Torres S, Amante CM, Penserga EG. The prevalence of rheumatic diseases in a Filipino urban population: a WHO–ILAR COPCORD Study. J Rheumatol. 1997;24(9):1814-9.
6. Bernstein J, Alonso DR, DiCarprio M, Friedlaender GE, Heckman JD, Ludmerer KM. Curricular reform in musculoskeletal medicine: needs, opportunities and solutions. Clin Orthop Relat Res. 2003;(415):302-8.
7. Morrison MC. Teaching of musculoskeletal medicine: a survey of general practitioners and deans. Med Educ. 1993;27(3):245-9.
8. Plant MJ, Linton S, Dodd E, Jones PW, Dawes PT. The GALS locomotor screen and disability. Ann Rheum Dis. 1993;52(12):886-90.
9. Allport GW. Attitudes. In Murchison, CM, eds. Handbook of Social Psychology. Winchester: Clark University Press, 1935.
10. Fox RA, Dacre JE, Ingham Clark CL, Scotland AD. Impact on medical students of incorporating GALS screen teaching into the medical school curriculum. Ann Rheum Dis. 2000;59(9):668-71.
11. Cantillon P, Jones R. Does continuing medical education in general practice make a difference? BMJ. 1999;318(7193):1276-9.
12. Dacre JE, Fox RA. Series on education: How should we be teaching our undergraduates? Ann Rheum Dis. 2000;59(9):662-7.
13. Coady D, Walker D, Kay L. The attitudes and beliefs of clinicians involved in teaching undergraduate musculoskeletal clinical examination skills. Med Teach. 2003;25(6):617-20.