

TITLE

Cardiac Patients' Knowledge and Use of Sublingual Glyceryl Trinitrate (SLGTN)

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Authors:

Ming-I Fan

MAP, MHSM, RN, BN

Mailing address: 46 Feng-Nian Rd., Miaoli City, Taiwan R.O.C. post code: 36044

E-mail address: phoebe0612@gmail.com

Marion Mitchell

PhD, BN(Hon), Grad Cert Higher Ed, RN, RM, CHN.

Mailing address: School of Nursing and Midwifery, Griffith University, University
Drive, Meadowbrook, Qld 4131, Australia.

E-mail address: marion.mitchell@griffith.edu.au

Marie Cooke

PhD, MSPD, RN

Mailing address: School of Nursing and Midwifery, Griffith University, University

Drive, Nathan, Qld 4111, Australia.

E-mail address: m.cooke@griffith.edu.au

KEY WORDS

Sublingual glyceryl trinitrate, medication self-administration, knowledge, angina, chest pain

ABSTRACT

Objective- This study examined cardiac patients' knowledge and use of sublingual glyceryl trinitrate.

Design- A non-experimental, retrospective descriptive design with a convenience sampling strategy was used.

Setting and Subjects- Participants were cardiac in-patients who were prescribed sublingual glyceryl trinitrate (SLGTN) at the site hospital.

Main outcome measure(s)-Participants' knowledge and use of SLGTN was assessed using the Sublingual Nitroglycerin Interview Schedule (SNIS) which is a valid and reliable tool.

Results- Fifty-two in-patients of a general cardiac ward or coronary care unit were approached. A total of 41 (87.2%) participants were enrolled and all completed the survey. Participants' mean Knowledge score regarding SLGTN was 3.98 ($SD = 1.21$),

and the mean Use score was 3.68 ($SD = 1.12$). Only about one quarter of the participants (24.4%) knew that using SLGTN to prevent chest pain is an appropriate use for the drug. Males were significantly more likely to incorrectly transport their SLGTN than the females in the study ($t = -5.316$, $df = 21.8$, $p = <.000$).

Conclusions- Findings indicate that patients' have limited knowledge of and do not always appropriately use SLGTN, particularly in terms of the way men transport the medication. Therefore, there is a need to develop and implement educational strategies to facilitate greater self-management of angina.

INTRODUCTION

Coronary Heart Disease (CHD), also known as coronary artery disease or ischaemic heart disease, is the most common heart disease in Australia (Australian Institute of Health and Welfare [AIHW] 2004). In 2003-04, cardiovascular disease was the principal diagnosis for hospitalisation in Australia, and more than one-third were the result of CHD (Australian Bureau of Statistics 2006). Patients with CHD are at increased risk of premature death, myocardial infarction and other vascular events (McIntosh 2004).

Angina is a common symptom of CHD and is self-managed on a day to day basis (Liu *et al.* 2006) with sublingual glyceryl trinitrate (SLGTN), a standard treatment for angina pain control (Quinn *et al.* 2002). It is therefore essential that people who experience angina pain have a good knowledge of SLGTN to promote their autonomy and self-care and to decrease complications. Weetch (2003) found that patients hospitalised with angina wanted to know more about its causes, treatment, medication and the effect angina had on daily activities. This need was universal across studies from the United Kingdom and United States of America and more importantly, studies found that participants did not have enough knowledge of SLGTN for safe and appropriate self-administration (McGovern *et al.* 2001, Kimble and Kunik 2000,

Ingram and Love 1999). No Australian study has examined the level of patient's knowledge or use of SLGTN specifically. Fennandez et al. (2007) however in an Australian study looking at long-term adherence to medications following percutaneous coronary intervention found that although the use of nitro-glycerine medication for angina was minimal, many participants' knowledge of the correct storage for this medication was poor.

AIM

The purpose of this study was to examine cardiac patient's knowledge and use of their prescribed SLGTN, and to identify patient characteristics which influence the level of knowledge and use. The two questions are:

1. What are patient's level of knowledge and use regarding SLGTN?
2. Which patient characteristics influence the level of knowledge and use of SLGTN?

METHOD

The study utilised a non-experimental, descriptive design.

Sample and setting

Convenience sampling was used and the target participant group included cardiac

in-patients who were prescribed SLGTN (tablets or sprays) at the site hospital. The inclusion criteria included: (1) Patients who were prescribed SLGTN (tablets or sprays); (2) aged over 18 years; and (3) able to cognitively understand and complete the survey (as assessed by the registered nurse in charge of the wards). Participants were excluded if they (1) were in the terminal phase of their illness; (2) were experiencing pain; (3) were Non-English speaking or (4) prescribed buccal GTN. Recruitment for the study was undertaken within two cardiac wards of a small public metropolitan teaching hospital in Brisbane, Australia. The hospital has a broad range of in and out-patient medical and surgical services and Intensive Care and Coronary Care Units.

Data Collection

Data collection occurred for one month during the first half of 2006. The registered nurse in charge of the wards introduced the study details to identified potential participants meeting inclusion criteria prior to introducing the researcher. Following informed consent procedures, the researcher asked each participant to complete the 20 to 30 minute survey.

Instrument

The Sublingual Nitroglycerin Interview Schedule (SNIS), which was developed by Kimble and Kunik (2000), was used for this study. Content and face validity were established (Kimble and Kunik 2000). The tool required modifications for the study

with 11 questions deleted as these focused specifically on the patient's last episode of pain which was not a focus for this study. The modified tool was piloted with two individuals similar to the target participant group to ensure appropriateness of the wording and content for an Australian setting. No changes needed to be made to the instrument.

The Knowledge subscale includes seven areas (see Table 2). Each question within this subscale asked for a yes = 1 or no = 0 response with a yes response indicating a correct response. As such, the possible range of scores on the Knowledge subscale is zero to seven. The Use subscale includes five areas (see Table 3) and was also scored with yes = 1 as the correct response. The possible range of scores on the Use subscale is zero to five (Kimble and Kunik 2000). Higher scores represent more knowledge about, or better use of SLGTN (Kimble and Kunik 2000). The internal consistencies for these subscales were examined with the Cronbach's alpha of 0.63 for each of the Knowledge and Use subscales (Kimble and Kunik 2000). There were a total of 65 questions in the survey. Seven demographic questions were added by the researchers to allow for a description of the sample and to assess any significance in relation to knowledge and use scores.

Data analysis

The data were entered into the Statistical Package for the Social Sciences (Version 13.0).

A Kolmogorov-Smirnov test of the data was non-significant so parametric testing was used. Descriptive statistics such as frequencies, means and standard deviation were used to examine demographic variables. Inferential analysis was used to test the difference in means of the Knowledge and Use scores. Pearson's correlation and one-way analysis of variance (ANOVA) were also used to analyse data. The level of significance for this project was set at an alpha level of 0.05.

ETHICAL CONSIDERATIONS

Ethical approval was granted from the site and the University prior to recruiting participants. Written informed consent was obtained from all participants.

RESULTS

Fifty-two in-patients of a general cardiac ward or coronary care unit were approached.

Forty-seven (90.4%) met the inclusion criteria, with five (9.6%) excluded because they lacked sufficient cognition to be able to give informed consent. Six (12.8%) declined to take part in this research. A total of 41 (87.2%) participants were enrolled and all completed the survey.

The sample included patients who administered SLGTN either in tablet (n = 21, 51.2%) or spray form (n = 20, 48.8%). Most had used SLGTN for months or years (70%, range 0.3 - 25 years) with some identifying its use for the first time ever during the current hospitalization (30%). Of the 41 participants enrolled in the study, 23 were male and 18 were female. Participant ages ranged from 31 to 90 years of age with the majority aged between 51 to 70 years old (n = 23, 56.1%) (see Table 1).

Table 1. Demographic Characteristics

Item	Category	n	%
Gender	Male	23	56.1
	Female	18	43.9
Age	31-40 yrs	1	2.4
	41-50 yrs	7	17.1
	51-60 yrs	12	29.3
	61-70 yrs	11	26.8
	71-80 yrs	9	22.0
	81-90 yrs	1	2.4
Marital status	Single	3	7.3
	Married	26	63.4
	Separated/Divorced	8	19.5
	Widowed	4	9.8
Education	Less than high school	5	12.2
	High school	30	73.2
	Greater than high school	6	14.6
Employment status	Employed	10	24.4
	Not working outside home	12	29.2
	Retired	19	46.3
Previous use of SLGTN	Months or years	29	70.7
	First time users this visit	12	29.3
SLGTN form	Tablet	21	51.2
	Spray	20	48.8

Participants' Knowledge of SLGTN

The possible range of scores in relation to participant's Knowledge of SLGTN was from zero to seven with higher scores representing more knowledge. The total mean Knowledge score for the sample was 3.98 ($SD = 1.21$, range = 1 - 7). The mean Knowledge score of men in the sample was 3.91 ($SD = 1.28$, range = 1 - 7) with women gaining a higher mean score of 4.06 ($SD = 1.16$, range = 2 - 6). However, there was no significant difference between male and female total scores ($t = -.369$, $df = 39$, $p = .71$). As well, there were no significant differences in individual items between men and women however; females gave an incorrect answer to item seven more frequently than the male participants.

Participants were knowledgeable about the proper way to store and transport SLGTN (see Table 2). Only about one quarter of the participants knew that using SLGTN to prevent chest pain is an appropriate use for the drug. There were no significant gender differences between most of the Knowledge items; however, most females did not know that SLGTN could be used to prevent chest pain (see Table 2).

Table 2: Knowledge Subscale Test Results by Item (*% for correct answer given by gender)

Item number	Item Area	Male n = 23 (%*)	Female n = 18 (%*)	Total n = 41 (%)
1	How does anginine tablets or nitrolingual spray work?	8 (34.8)	7 (38.9)	15 (36.6)
2	The proper way to store and transport anginine tablets or nitrolingual spray.	20 (87.0)	17 (94.4)	37 (90.2)
3	Limit on number of anginine tablets or nitrolingual spray taken during any pain episode	11 (47.8)	9 (50.0)	20 (48.8)
4	Proper time sequencing of anginine tablets or nitrolingual spray doses.	11 (47.8)	10 (55.6)	21 (51.2)
5	Appropriate body position to take anginine tables or nitrolingual spray	17 (73.9)	15 (83.3)	32 (78.0)
6	Appropriateness of taking anginine tablets or nitrolingual spray for other symptoms	15 (65.2)	13 (72.2)	28 (68.3)
7	Whether using anginine or nitrolingual to prevent chest pain is appropriate?	8 (34.8)	2 (11.1)	10 (24.4)

Other important findings related to knowledge, side effects and previous experiences

Participants were asked the correct way to check if their SLGTN had expired. All of the participants who were prescribed SLGTN spray knew how to check the expiration date of the medicine. For those who were prescribed the tablet form of SLGTN, just under half did not know how to check the expiration date. Participants were also asked about the characteristics of SLGTN at administration time. Over a quarter of the participants (26.8%) thought SLGTN needed to burn or sting when used to be

effective.

Participants were asked of their side effects from the drug. Although one third developed headaches or were dizzy the first time they took the medication, over 70% of those who had had reactions to their SLGTN did not change the way they used their SLGTN. However, 30 % did change the form of SLGTN and saw a reduction in the occurrence of side effects by taking another form of SLGTN (either changed from tablet to spray, or from spray to tablet). This finding may be important for providing advice to clients about options available if they experience side-effects.

Participants were asked when they last received information about SLGTN by a health care professional. Most of the participants (n = 23, 56.1%) claimed that they had not received any SLGTN instruction for more than one year (from one to over 10 years), and some could not remember their last SLGTN instruction. Doctors were the most frequent providers of instructions about SLGTN (78%) in this group.

Participants' Use of SLGTN

Twenty-eight of the 41 participants were eligible to answer all Use questions as 12 were first-time users of the medication so did not have previous experience and one

participant had not experienced chest pain since the prescribing of the medication.

The possible range of scores in relation to participant's use of SLGTN was from zero to five with higher scores representing appropriate use of SLGTN. Women participants scored better than men with half answering all five questions correctly. The mean Use score for men was 3.43 ($SD = .94$, range = 1 - 4), and the mean Use score for women was 3.93 ($SD = 1.27$, range = 2 - 5). The total mean Use Subscale score was 3.68 ($SD = 1.12$, range = 1 - 5). There was no significant difference between male and females ($t = -1.19$, $df = 26$, $p = .25$).

Nearly all of the 28 eligible participants administered their SLGTN in the appropriate body position – sitting or lying down ($n = 27$, 96.4%). By contrast, fewer than half of the 28 participants ($n = 12$, 42.9%) transported SLGTN in a manner that would protect it from light and heat (See Table 3). However, most of the female participants transported SLGTN correctly by carrying the drug with them in their handbags. This gender difference was significant ($t = -5.316$, $df = 21.8$, $p = <.000$) (see Table 3).

Table 3: Use Subscale Test results by Item (*% for correct answer given by gender)

Item number	Item area	Male n = 14 (%*)	Female n = 14 (%*)	Total n = 28 (%)	p
1	Was SLGTN carried at all times?	12 (85.7)	11 (78.6)	23 (82.1)	
2	Was SLGTN stored in the appropriate container?	12 (85.7)	11 (78.6)	23 (82.1)	
3	Was SLGTN transported in a manner that would protect from light and heat?	1 (7.1)	11 (78.6)	12 (42.9)	<.000*
4	Was SLGTN taken when in appropriate body position?	14 (100)	13 (92.9)	27 (96.4)	
5	Was SLGTN taken for other symptoms beside angina pain?	9 (64.3)	9 (64.3)	18 (64.3)	

($p < .05$)*

Patient characteristics influencing the level of knowledge and use of SLGTN.

When participant characteristics were examined, none were found to be predictors of SLGTN knowledge. Pearson product-moment correlation analysis indicated that the Knowledge scores only accounted for 7.73% (r^2) of the variance of Use scores. This small positive relationship indicates that as Knowledge scores increase, so do the Use scores.

DISCUSSION

The current study found deficits in some areas of patients' knowledge and these may cause poor management of their cardiac condition, and more frequent episodes of angina (Adams *et al.* 2005, Lilley *et al.* 2005, Lehne 2004). Findings identified that

participants still need to improve their level of knowledge and SLGTN management which may further support self-care of their cardiac condition. Although participants lacked basic knowledge of the pharmacodynamics of their SLGTN, this did not equate to incorrect use of SLGTN. However, participants were at risk of overdosing on SLGTN because they were unaware of the limitations of doses. In practice, one-quarter of the participants who took more than one dose of SLGTN took them all together (at the same time). This may prove problematic as excessive dose of medication can cause direct physiological harm (Lehne, 2004) as reported by one participant who stated that on one occasion when she took too many tablets in a very short period of time she fainted. Patients who do not understand dose limitations and sequencing are at a risk of using SLGTN ineffectively while having chest pain and this may decrease their enabling skills to manage their chronic condition. Whatever mode of patient medication instruction is used (for example, leaflet or face-to-face,) therefore, correct SLGTN time sequencing needs to be clear (Timmins and Kaliszer, 2003).

Fewer than half of the overall sample (42.9%) and only 7.1% of men transported and protected SLGTN from light and heat. This leads to the possibility of patients (especially men) using medication with reduced potency (Lehne 2004, Bryant *et al.* 2003). Patient education could focus on strategies for men to appropriately carry and

transport their medications (not in their clothes' pockets).

In the current study, patients' knowledge about using SLGTN to prevent symptoms other than chest pain was poor (see Table 2). This indicates that appropriate patient education of SLGTN use for symptoms needs to be a crucial component of patient education (Timmins and Kaliszer 2003). Consistent with Kimble and Kunik (2000), only a small number of participants (24.4% in the current study) knew SLGTN can be used to prevent chest pain. This indicates possible limitations on the effectiveness of this first-line self-managed therapy to improve patients' quality of life and provide symptom control (Braden 1993).

It is suggested that SLGTN tablets should be replaced every 3 months after opening the container in order to maintain drug potency (Bryant *et al.* 2003, McCuistion and Gutierrez 2002). One-third of those who took SLGTN tablets and checked the expiry date of their medicine did not know to mark the new expiry date after opening the bottle. Some patients, therefore, are risking taking drugs with reduced potency thus being ineffective in improving myocardial oxygen supply for immediate symptom control.

Another area where participants' knowledge was lacking was their misconception that there needed to be a local reaction at the time of administration of SLGTN. Over a quarter of the participants in the current study (26.8%) thought SLGTN needed to sting or burn to indicate it was working effectively. Some participants revealed that if they did not feel any sting or burn when taking SLGTN, they would get a new prescription. This is an unnecessary waste of money and medication.

Consistent with other studies (Kimble and Kunik 2000) headaches were the most frequent side effect. However, contrary to Kimble and Kunik's USA study, all of the participants in the current study did not subsequently reduce their use of SLGTN. Rather, about 10% of the participants from the current study changed their way of using SLGTN by taking it in a different formulation (either from sprays to tablets, or from tablet to sprays), and all of them were satisfied with their new mode of drug administration. Perhaps in Australia, health professionals are proactive with their information on alternative drug administrative methods in the event of side effects.

An issue of great concern is that some participants did not always take SLGTN when experiencing chest pain. Their reasons included that they took digestion medication instead, or their medication was not available, or that ambulance personnel instructed

them to await their arrival. These findings showed that SLGTN information and instruction given by healthcare providers was inadequate for effective symptom control. It is critical that consistent information is given to patients by all health care professionals in order to reduce the risk of patients' mis-management of their angina symptoms.

CONCLUSIONS & RECOMMENDATIONS

The findings of this study are important for nurses and cardiac rehabilitation staff to consider when facilitating education sessions for patients regarding SLGTN in acute admission or rehabilitation situations. The results of the present study show that patients need to know more about the self-administration of SLGTN. It is known that repetition of patient education increases patient's recall of education advice (Jowett and Thompson, 2003). It is suggested, therefore, that healthcare professionals need to provide initial and on-going SLGTN education and maintenance programs (Jowett and Thompson 2003, Goble and Worcester 1999). This is particularly pertinent in the areas of angina prevention, storage and drug expiry status. Nurses in their role of healthcare providers, and in providing cardiac rehabilitation, are well placed to meet this need and promote long-term survival and recovery, as well as improved quality of life (Jowett and Thompson 2003, Timmins and Kaliszer 2003, Warrington *et al.* 2003).

LIMITATIONS

The small size of the study was a limitation and as such the results presented may reflect a Type II error. The convenience sampling method meant that participants may have been atypical of the population of interest with regard to critical variables (Polit and Beck 2004). The sample was drawn from one research site thus making results only applicable to that site thus restricting generalization.

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CONTRIBUTIONS

Study design: MF, MM, MC; data collection: MF; data analysis: MF, MM, MC; and manuscript preparation: MF, MM, and MC

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