

Availability and use of electrotherapy devices: A survey

Syed Ghulam Sarwar Shah, Alexandra Farrow, Alan Esnouf

Electrophysical agents such as radiofrequency electromagnetic fields (shortwave and microwave), ultrasound, laser and electrical stimulation are used for therapeutic purpose in physiotherapy departments. They are primarily used for treating a wide range of musculoskeletal injuries.

This study investigated the availability and use of therapeutic diathermy, ultrasound, laser, transcutaneous electrical nerve stimulation (TENS) and interferential equipment in 46 physiotherapy departments in NHS hospitals in the south of England, using a self-administered questionnaire.

Results indicated that therapeutic ultrasound was the most commonly available and most often used modality by surveyed departments. Pulsed shortwave diathermy, interferential, and laser were available to a lesser degree and also used less often. Continuous shortwave diathermy was used rarely and only in larger departments. Microwave diathermy was not available in any of the surveyed departments. The level of non-use of equipment despite availability was highest for continuous shortwave diathermy followed by pulsed shortwave diathermy and then laser.

The rare use and total non-use of some of the modalities, despite availability of equipment, may have implications for purchasers of this expensive equipment. While the findings of this study show a regional trend in NHS physiotherapy departments, this may not be generalizable to a national level.

Key words: Electrotherapy, electrophysical agents, equipment, National Health Service, physiotherapy, survey.

Shah S, Farrow A, Esnouf A (2007) Availability and use of electrotherapy devices: A survey. Int J Ther Rehabil 14(6): 260–264

Syed Ghulam Sarwar Shah is Research Fellow, Alexandra Farrow is Senior Lecturer and Course Director MSc Occupational Health & Safety Management and Alan Esnouf is Registered Physiotherapist and Lecturer in Physiotherapy, School of Health Sciences and Social Care, Brunel University, Uxbridge, Middlesex, UB8 3PH, UK

Correspondence to:
S Shah
Sarwar.Shah@brunel.ac.uk

Electrotherapy is an essential component of physiotherapy (Watson, 2000) and comprises application of different forms of electrophysical agents (EPAs) for therapeutic purpose. EPAs are applied by microwave diathermy (MWD), shortwave diathermy (SWD), interferential, transcutaneous electrical nerve stimulation (TENS), ultrasound and laser equipment. SWD is used in either pulsed (PSWD) or continuous (CSWD) mode. A list of the abbreviated agents can be found in Box 1

PSWD, ultrasound and laser are used for bio-stimulation of tissue. CSWD and MWD are used for heating of tissues to promote healing and resolution of musculoskeletal injury. TENS and interferential are used for electrical stimulation of muscle nerves to alleviate pain due to musculoskeletal injury (Fox and Sharp, 2007). Discussion about the mechanism of application and resultant therapeutic effects of these modalities is beyond the scope of this paper and readers should consult the relevant literature.

According to Kitchen and Partridge (1997), the use of any electrotherapy modality depends on the availability of equipment. A survey of ownership and use of various electrotherapy modalities in NHS physiotherapy departments by Pope et al (1995) found that ultrasound, PSWD, interferential and TENS were the four most commonly owned and used modalities. The survey did not report total non-use of any of the surveyed electrotherapy modalities. Kitchen and Partridge (1996) studied availability and use of ultrasound, PSWD, CSWD and laser in physiotherapy outpatient departments in the NHS in England. They reported that ultrasound was available in all responding departments and that PSWD, CSWD and laser were available in 98%, 85% and 33% of responding departments, respectively. They found that ultrasound, PSWD and CSWD were used more than once a week by 76%, 72% and 16% of departments respectively and the use of PSWD and CSWD was lower than ultrasound in all surveyed

departments. According to Grant (2001), the use of CSWD and MWD has almost disappeared in the last few years, whereas PSWD is still used in physiotherapy departments. In addition, one of the authors (AE) has observed a change in usage of electrotherapy modalities, particularly CSWD and MWD, when visiting physiotherapy students in various departments in the south of England. However, the exact status of current use of EPAs in clinical practice, especially in NHS physiotherapy departments, is not available. To determine current electrotherapy practice, it is important to investigate the availability and use of equipment used for therapy with EPAs.

The objectives of this study were therefore to investigate the availability and frequency of use of the following modalities in NHS physiotherapy departments in the south of England:

- n SWD
- n MWD
- n Ultrasound
- n Laser
- n TENS
- n Interferential.

METHODS

Design

Using a self-administered questionnaire, a cross-sectional survey was carried out in 46 NHS hospital physiotherapy departments and clinics in the south of England. The number of departments selected was limited due to funding; however, all 46 departments were visited by the authors to validate the information reported and ensure the quality of data, as well as to study departmental practices from the health and safety remit of this project (not described here).

Participant recruitment

A list of 107 physiotherapy departments located in the south of England was obtained from the physiotherapy section of the Department of Health and Social Care at Brunel University. From this list, a stratified random sample of 57 departments in various NHS hospitals in Greater London and 12 counties in southern England was selected. Selected departments included large departments

in urban centres as well as small community clinics. Departments were contacted by telephone and letter; and the physiotherapy manager or superintendent physiotherapist was requested to complete a consent form regarding participation in the study. Two departments replied stating that they were not interested in the study and nine departments did not respond. After receipt of consent, 46 departments were sent a self-completion survey questionnaire, a covering letter and instructions for completing the questionnaire. In particular, the letter requested that the respondent completing the questionnaire would do so after consulting with members of the department who used the electrotherapy equipment most often.

Ethical approval

Ethical approval for this study was obtained from the Multi-centre Research Ethics Committee (Wales), Research Protocol 02/9/04 and the Ethics Committee at Brunel University.

Survey instrument

A survey questionnaire was developed in-house that requested the number of devices available, their use and the frequency of use in the department. The questionnaire contained mostly closed questions. A Likert scale question ranked the frequency of use of different types of modalities on a nine-point scale, i.e. point one for the most commonly used modalities and point nine for the most rarely used modalities. The questionnaire was validated before administration by piloting among staff in the Department of Health Studies and Social Care at Brunel University. The final version of the questionnaire is available from the authors.

Data compilation and analysis

The data were collected from October 2002 to July 2003. Frequencies and descriptive statistics using the Statistical Package for Social Sciences (SPSS) for Windows (version 13) were used for the analysis.

RESULTS

Availability and number of electrotherapy devices

The availability and number of devices by type of electrotherapy modality are shown in Figure 1. Ultrasound equipment was available in all responding departments ($n=46$) whereas MWD equipment was not available in any department.

The number of various types of electrotherapy devices available in the department is shown in Figure 2. The maximum number of devices per department was 88 for TENS, 14 for ultrasound, 6 for PSWD, 5 for interferential, 3 for CSWD and 2 for laser.

Box 1. List of abbreviations for electrophysical agents

CSWD	Continuous Shortwave Diathermy
MWD	Microwave Diathermy
PSWD	Pulsed Shortwave Diathermy
SWD	Shortwave Diathermy
TENS	Transcutaneous Electrical Nerve Stimulation

The authors divided departments into small departments (having ten or fewer full-time physiotherapists) and large departments (having more than ten full-time physiotherapists). Results showed that the department size was significantly and positively related ($r=0.374$, $P=0.05$) to the number of ultrasound devices only and not related to the number of any other type of device.

Figure 1. Availability of electrotherapy devices in departments

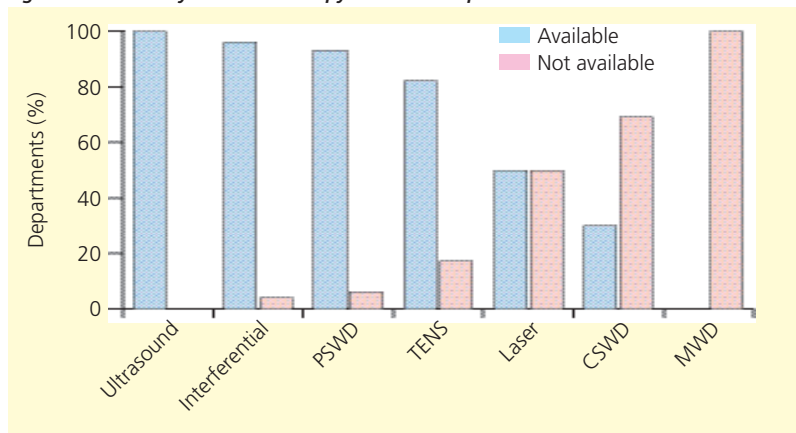


Figure 2. Number of electrotherapy devices available in the department

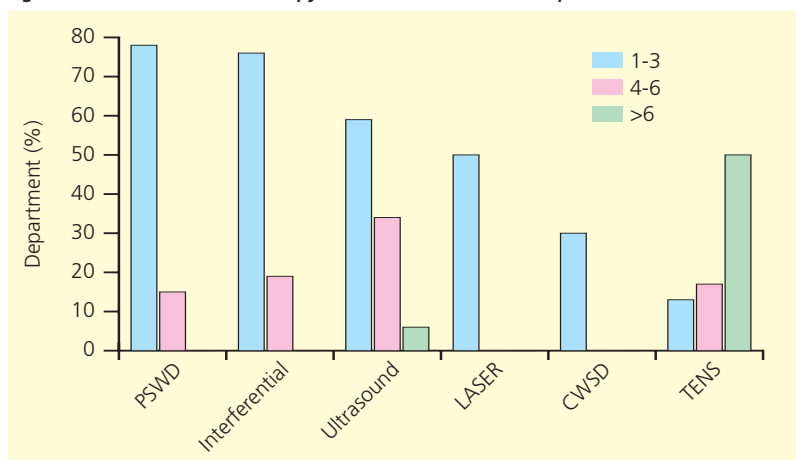
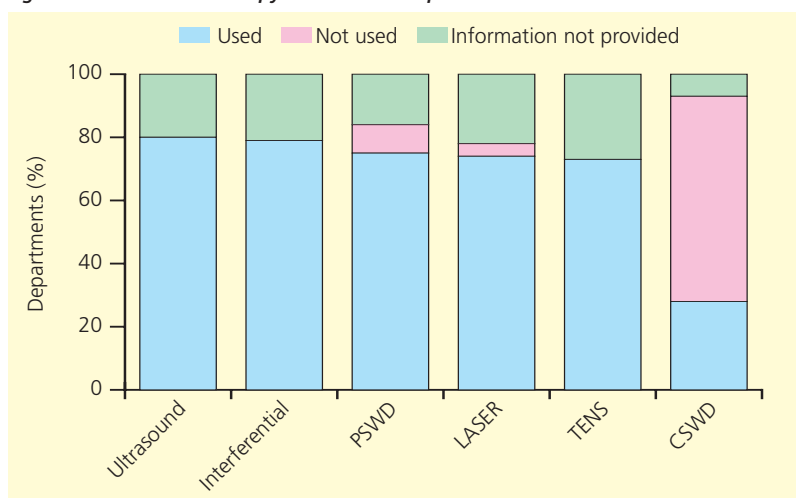


Figure 3. Use of electrotherapy modalities in departments that had the devices



Use of equipment

The use of electrotherapy modalities in departments where equipment was available is shown in Figure 3. The use of equipment varied between departments despite the availability of equipment. The modality used by the greatest number of departments ($n=37$, 80.4%) was ultrasound and the modality used by the least number of departments ($n=4$, 8.7%) was CSWD. Non-use of modalities despite availability was highest for CSWD followed by PSWD and then laser.

CSWD was used in large departments only. Despite the availability of equipment it was not used in small departments. PSWD was used in both small and large departments, and the non-use of PSWD was greater in large departments. Non-use of laser despite availability was only found in small departments.

Frequency of equipment use

Figure 4 shows the ranking of the frequency of use of the various modalities reported by departments on a Likert scale from most commonly used (rank first) to least used (rank ninth).

The greatest number of departments ranked the use of ultrasound, TENS and interferential as first choice, the use of PSWD as second choice and the use of CSWD as sixth choice. An equal number of departments ranked the use of laser as first and second choices.

DISCUSSION

The recruitment rate in this study was 81% (46 out of 57 departments); however, all 46 departments that agreed to take part in the study completed and returned the survey questionnaire. Thus, the response rate was 100%.

Results indicate that ultrasound, interferential and PSWD devices were the most commonly available and most used modalities in the surveyed departments. However, because of the regional nature of this survey these findings cannot be assumed to represent the rest of the UK.

Ultrasound

Use of therapeutic ultrasound in Britain was found in 25% of NHS hospitals (ter Haar et al, 1987). Pope et al (1995) reported that all of the NHS physiotherapy departments surveyed in England owned and used ultrasound. High frequency of use of ultrasound in England was also reported by Turner and Whitfield (1997a) and Kitchen and Partridge (1996; 1997). The present study found that ultrasound is still the most commonly available and used electrotherapy modality, in agreement with previous studies (Lindsay et al, 1990; 1995; Pope et al, 1995; Kitchen

and Partridge, 1996; 1997; Robertson and Baker, 2001). The study also found that ultrasound devices were available in all responding departments (n=46) with none of the departments reporting non-use of this modality.

Interferential

In 1995, Pope et al reported that interferential with electrodes and interferential with suction electrodes were available in 95% and 86%, respectively, and used by 99.5% and 90% departments, respectively, where equipment was owned. The present study did not request information regarding the availability and use of interferential by type but as interferential only. Results showed that this modality was available in 96% departments and used by 80% of departments that had the equipment. This suggests that there has been a decline in the use of this modality since 1995.

TENS

In the present study, the use of TENS was less than that reported by Pope et al (1995). This indicates that the use of TENS has decreased in the NHS departments surveyed in this study.

SWD: CSWD and PSWD

In their 2001 study, Shields et al reported that the maximum number of SWD devices per department was three; however, they did not provide a break-down between CSWD and PSWD. Lindsay et al (1990; 1995) and Cooney et al (2000) reported greater availability of CSWD than PSWD devices. However, the present study found availability of PSWD devices to be higher than CSWD; with a maximum of three devices for CSWD and eight devices for PSWD, per department.

According to Al-Mandeel and Watson (2006), SWD is widely used in the UK. Shields et al (2001) reported the use of PSWD and CSWD to be equal in Ireland. However, in the present study the number of departments that used PSWD was greater than those that used CSWD. The greater use of PSWD compared to CSWD in NHS departments may be due to preference for use of non-thermal modalities by physiotherapists in Britain (Kitchen and Partridge, 1996).

Laser

In the present study, the availability and use of laser was lower than that reported by Pope et al (1995) who found laser equipment available in 52% departments and used by 86% departments that owned the equipment. The number of laser devices per department in the present study was in accord with McMeeken and Stillman (1993), who found a maximum number of three laser devices per department.

However, use of laser in departments where

devices were available was higher in the present study than that reported by Lindsay et al (1990). In the present study, the use of laser was greater than use of CSWD but less than ultrasound and PSWD, in accordance with the findings of Kitchen and Partridge (1996).

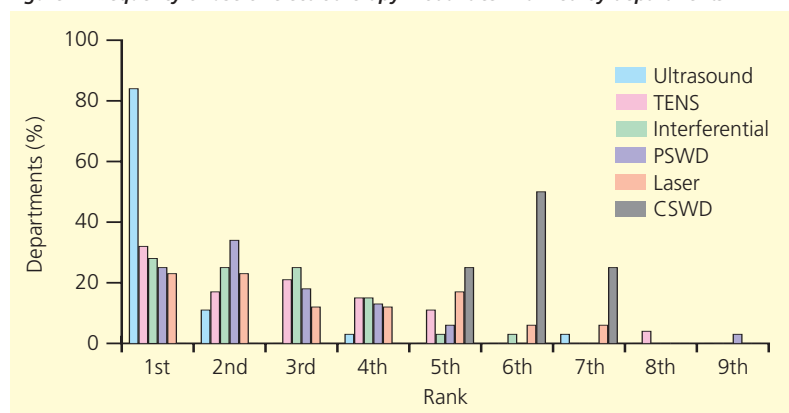
Non-use despite equipment availability

Non-use of MWD despite availability of the equipment in some departments was reported by Ide and Partridge (1986) and Pope et al (1995). The present study confirms previous findings that there is non-use of PSWD and CSWD despite equipment availability in some departments (Pope et al, 1995; Shields et al, 2001). However, non-use of CSWD and PSWD was higher than that reported by Pope et al (1995). The present study also highlights non-use of laser despite availability of the devices.

The authors did not ask for reasons for the non-use or the rare use of the surveyed modalities. Kitchen and Partridge (1996) have argued that the use of electrotherapy modality depends on the availability of the equipment. However, like many previous studies (Ide and Partridge, 1986; Pope et al, 1995; Shields et al, 2001), the present study's findings reveal non-use of some of the modalities despite the availability of equipment. This suggests that the use or non-use of electrotherapy modalities is determined not only by the availability of equipment but also by other factors. The following factors have been suggested:

- n Issue of efficacy (Kitchen, 1995; Robertson and Spurrirt, 1998)
- n Physiotherapist's choice (Pope et al, 1995)
- n Knowledge of a particular modality (Turner and Whitfield, 1997b; 1999)
- n Safety concerns (Larsen et al, 1991; Ouellet-Hellstrom and Stewart, 1993; Robertson and Spurrirt, 1998; Lerman et al, 2001)
- n The nature of the clinical condition being treated (Kitchen and Partridge, 1996).

Figure 4. Frequency of use of electrotherapy modalities – ranked by departments



CONCLUSION

This study investigated the availability and use of various electrotherapy modalities for treatment in a sample of NHS physiotherapy departments in Greater London and 12 counties in south England. The availability and use of the equipment was found to vary between surveyed departments. Therapeutic ultrasound was the most commonly available and most commonly used modality, whereas MWD was not available at all. The order of frequency of use was as follows:

1. Ultrasound
2. Interferential
3. PSWD
4. Laser
5. TENS
6. CSWD.

The non-use of CSWD, PSWD and laser despite equipment availability in some NHS physiotherapy departments in south England has important implications for purchasers of such expensive devices. However, further investigation is warranted as this may be a regional trend, which may not be generalized throughout the UK. [UTR](#)

This study was funded by Health & Safety Executive, UK (Grant. No. 4371/R47.022). The authors wish to thank all the physiotherapists including managers and superintendents within NHS physiotherapy departments for their time in taking part in this study. The authors acknowledge helpful comments from the International Journal of Therapy and Rehabilitation's anonymous reviewers.

Conflicts of interest: none.

- Al-Mandee MM, Watson T (2006) An audit of patient records into the nature of pulsed shortwave therapy use. *International Journal of Therapy and Rehabilitation* 13: 414–20
- Cooney M, Mullins G, Gallen C (2000) A survey of electrotherapy modalities: public and private practices in the Republic of Ireland. *Physiotherapy Ireland* 21: 3–8
- Fox JE, Sharp TN (2007) *Practical Electrotherapy - A Guide to Safe Application*. Churchill Livingstone, Philadelphia, PA.
- Grant L (2001) Radio frequency in physiotherapy. In: Abstracts of IPPEM meeting 'Electrotherapy - Clinical Effectiveness, Safety and Quality Assurance' Birmingham.

- Institute of Physics and Engineering in Medicine (IPEM), 17 May: 15–16
- Ide L, Partridge CJ (1986) A survey of electrotherapy equipment in physiotherapy departments and private practice. The Chartered Society of Physiotherapists, London
- Kitchen SS (1995) Ultrasound, shortwave diathermy and laser treatment: an exploratory interview study. *British Journal of Therapy and Rehabilitation* 2: 495–501
- Kitchen SS, Partridge CJ (1996) A survey to examine the clinical use of ultrasound, shortwave diathermy and laser in England. *British Journal of Therapy and Rehabilitation* 3: 644–50
- Kitchen SS, Partridge CJ (1997) Ultrasound, shortwave diathermy and laser: a survey to examine patterns of use in England. *British Journal of Therapy and Rehabilitation* 4: 75–78
- Larsen AI, Olsen J, Svane O (1991) Gender-specific reproductive outcome and exposure to high-frequency electromagnetic radiation among physiotherapists. *Scand J Work Environ Health* 17: 324–29
- Lerman Y, Jacobovich R, Green MS (2001) Pregnancy outcome following exposure to shortwaves among female physiotherapists in Israel. *Am J Ind Med* 39: 499–504
- Lindsay D, Dearness J, McGinley C (1995) Electrotherapy usage trends in private physiotherapy practice in Alberta. *Physiother Canada* 47: 30–34
- Lindsay D, Dearness J, Richardson C, Chapman A, Cuskelly G (1990) A survey of electromodality usage in private physiotherapy practices. *Aust J Physiother* 36: 249–56
- McMeeken J, Stillman B (1993) Perceptions of the clinical efficacy of laser therapy. *Aust J Physiother* 39: 101–08
- Ouellet-Hellstrom R, Stewart WF (1993) Miscarriages among female physical therapists who report using radio- and microwave-frequency electromagnetic radiation. *Am J Epidemiol* 138: 775–86
- Pope GD, Mockett SP, Wright JP (1995) A survey of electrotherapeutic modalities: ownership and use in the NHS in England. *Physiotherapy* 81: 82–91
- Robertson VJ, Baker KG (2001) A review of therapeutic ultrasound: effectiveness studies. *Phys Ther* 81: 1339–50
- Robertson VJ, Spurr D (1998) Electrophysical agents: implications of their availability and use in undergraduate clinical placements. *Physiotherapy* 84: 335–44
- Shields N, Gormley J, O'Hare N (2001) Short-wave diathermy in Irish physiotherapy departments. *British Journal of Therapy and Rehabilitation* 8: 331–39
- ter Haar G, Dyson M, Oakley EM (1987) The use of ultrasound by physiotherapists in Britain, 1985. *Ultrasound Med Biol* 13: 659–63
- Turner PA, Whitfield TWA (1997a) A multidimensional scaling analysis of the techniques that physiotherapists use. *Physiother Res Int* 2: 237–54
- Turner PA, Whitfield TWA (1997b) Physiotherapists' use of evidence based practice: a cross-national study. *Physiother Res Int* 2: 17–29
- Turner PA, Whitfield TWA (1999) Physiotherapists' reasons for selection of treatment techniques: a cross-national survey. *Physiother Theory Pract* 15: 235–46
- Watson T (2000) The role of electrotherapy in contemporary physiotherapy practice. *Man Ther* 5: 132–41

KEY POINTS

- n This survey showed that microwave diathermy was not available in any of the surveyed departments.
- n Ultrasound, interferential, pulsed shortwave diathermy, transcutaneous electrical nerve stimulation and laser were used by more than 70% of departments that had the equipment.
- n Continuous shortwave diathermy was used rarely and in larger departments only. In some departments, continuous shortwave diathermy, pulsed shortwave diathermy and laser were not used despite availability of equipment.
- n The use or non-use of electrotherapy modalities is not dependent on the availability of equipment only but other factors are also involved.
- n Non-use of CSWD, PSWD and laser equipment despite availability may have implications for the purchasers of this expensive equipment.