

DISCUSSION

Use of numerous forms of notation in Chiropody records is of concern, where those lesions are intended to give specific information on lesions and treatment. This could also compromise identification from these records. This concern over the lack of standardised notation is compounded by several abbreviations being taught with multiple meanings (Table 4) and by practitioners introducing personal abbreviations. However, in identification situations, Chiropodists would understand the meaning intended behind their own records, even when others are unsure, the only problem using Chiropodists who made the record in identification being where they are untraceable, or deceased. Lack of standardized notation indicates the recommendations of Idris-Evans and Pooke to record notes in full, to be adviseable, however, standardized notation would be advantageous in that Chiropodists are more likely to record all treatment and lesion details, when a rapid, accurate system of notation is available, which would be understood by all Chiropodists. A standardized system should allow great specificity of lesion descriptions and their sites, to be useful in identification. In this context, such notation would not require understanding by other Health Professionals, as recommended by Idris-Evans and Pooke (Idris-Evans D and Pooke M J, Ch.17, recommendation 5) as the excellent dental identification system utilizes records

only easily understood by dental personnel.

Therefore, writing of details in full, or implementation of a National notation system is recommended.

While such a system does not exist, any Chiropodist assisting in identification may need to consult Chiropodists whose notes are involved, or obtain knowledge of where that Chiropodist trained (and therefore knowledge of the notation system used), to be confident that correct information is elucidated from those notes. Of these suggestions, involvement of the original Chiropodist is preferable, to explain any personal notation. Investigation into notation used by Un-Registered Chiropodists is also indicated.

In determining approximate numbers who currently receive chiropody treatment, several discussion points arise.

Firstly, this section dealt only with subjects who had received State-Registered chiropody treatment. There are many Un-Registered chiropodists in the country, therefore some individuals must only receive Un-Registered chiropody treatment. Little is known of notation standard in the Un-Registered sector, which is not regulated by the Council for Professions Allied to Medicine, or the Society of Chiropodists, hence these practices were ignored by this project, but future studies are indicated to determine the usefulness of Un-Registered Chiropodists records in

identification and to determine approximate numbers receiving such treatment.

National Statistics used in this project were assumed to be correct. Statistical estimation of the probable numbers receiving chiropody treatment from the Eastern Health Service Board in Northern Ireland gave a wide range for probable numbers of individuals receiving treatment. The estimation was also based on a low sample of only three other Health Boards, and assumed normal Distribution, which may be incorrect, compromising the estimates accuracy. In suggesting that enough individuals receive chiropody treatment in the U.K. for identification from records to be feasible, an accurate figure is not required. However, this aspect of study would be better undertaken when chiropody statistics for Northern Ireland have been fully compiled. The study could have produced an accurate figure for mainland Britain only, as opposed to the U.K., but was based on the assumption that Northern Ireland Health Boards were keeping chiropody data, as are all mainland Health Authorities. The fact that this was not the case, necessitated the somewhat precarious statistical estimation undertaken for the Northern Ireland Eastern Board.

In requesting private practices participating in the questionnaire, to estimate attending patient numbers, where exact figures were unknown, a potential inaccuracy was introduced. This could have been avoided by counting

records at practices involved, but would be expensive and time-consuming, with possible access problems. In adjusting the figure obtained from this questionnaire, via NHS patient questionnaire, 100% response was obtained, as patients completed the questionnaire during attendance. This questionnaire was not ideally distributed, in that participating patients resided within the same Health District. Other Districts may demonstrate different results for numbers receiving both NHS and Private State-Registered chiropody treatment for reasons such as different satisfaction with NHS treatment, discrepancies in territorial justice, different availability of private practices, ratio of State-Registered to Un-Registered practices, and different financial status of subjects in different Health Districts. This aspect of study could be improved by distributing the questionnaire to randomly chosen Health Districts, but the scale of this measure, and potential co-operation problems from busy Districts are beyond the scope of this study, which did not demand a suggested figure for numbers receiving State-Registered chiropody treatment of great accuracy.

Statistics from the private practice questionnaire of numbers attending each practice demonstrated a positively skewed distribution, with a second slight peak at 3201-4000 patients/practice. This skew may be because of listed small part-time practices operated to supplement NHS salary. The second slight peak may correspond to the mean

number of patients/practice for full time practices, or may flatten with a larger sample. The first option, however, appears the most likely.

The final figure of suggested numbers receiving State-Registered chiropody treatment in the U.K. give 95% certainty over a wide range. As the purpose of this aspect of study was to demonstrate that reasonable numbers receive State-Registered chiropody treatment and have chiropody records, a more accurate figure taking measures outlined above, with larger sample numbers would be expensive and is not essential for this purpose.

The examination of chiropody records for adequate differentiation for identification demonstrated that lesion patterns constitute an identity, i.e. a wide range of patterns was observed. Lesion patterns were not considered different, if visual identification would not distinguish between them, even if slight differences were recorded. The information recorded on the 300 records used implied that most patterns of chiropodial pathology occur in less than one in 300 chiropody patients. Even the most frequently observed chiropodial status of recorded, or implied subungual debris of both sulci of both 1st nails was only observed in one in 30 subjects. When taking the entire foot into consideration, there must be considerably more observable lesion patterns than this, and probably considerably more than the 264 patterns observed in this project. Further studies involving larger sample sizes are

indicated, to determine the extent and ratio of lesion patterns.

Lesions recorded on the 300 records were permanent (e.g. Onychogryphosis), impermanent (e.g. Callus), or implied (e.g. 1st medial sulcus cleared implies subungual debris). In identification, recorded permanent lesions would carry greater authority than others, but if it could be demonstrated that impermanent lesions have been present for several years due to unchanging structural defects, or persistent bad footwear habits, greater strength may be added to identification from such lesions. The presence of these lesions in a relatively unusual site (e.g. Heloma Durum on the dorsum of the Extensor Hallucis Longus tendon) may also strengthen such evidence.

Inadequacies exist in this section of the project, which could be answered by future investigations. A problem with lesion topography described could be that despite there being a high degree of individuality observed in the sample, due to extrinsic factors such as change of walking habit or footwear style, to some extent, lesion patterns may change in an individual. The procedure used here only demonstrated differentiation at a particular moment in time. A longitudinal study of chiropodial status is indicated and may demonstrate in some individuals a limited spectrum of lesion combinations depending on extrinsic behaviour.

The results in this section were obtained, assuming that record card information was correct and details of lesions had been written in full. If this is not the case, the results may have been slightly different. If cards were incorrect, or incomplete, this would render records useless, or misleading in identification. There appears to be at least short-term identity expressed in chiropodial lesion patterns as noted on patients records. Potential change in chiropodial features should not preclude the use of chiropody records in identification, as forensic science has long accepted that few physical features remain constant in life, thus favouring the importance of using the last known description for identification (Keiser-Neilson S 1977, p.87). This identity may be compromised in practice by inaccurate, or incomplete recording of lesion and treatment details, but as forensic investigators seek indicative features as pointers toward identity, chiropodial records in their present form could assist identification investigations, giving positive identification, indication towards positive identification, supplementing dental or other evidence, or demonstrating exclusion of an unknown. Further studies should investigate lesion stability/longevity, to strengthen or refute chiropodial evidence and investigate possible permanent histological changes that may still be present after a soft tissue lesion has resolved to the naked eye. This study was undertaken in NHS situations, on records appertaining to subjects aged 65 plus. A similar

investigation of private practice and Chiropody Schools records which may contain details of younger subjects is required, with attention to longevity and permanence of lesions in such subjects. Diagnosis details were not considered in this aspect of study, as many records did not list diagnoses, despite allocated sections for this. The recording of such information (e.g. Hallux Valgus, Hammer Toe) usually refers to permanent defects, and would enhance the importance of chiropody records in identification. Chiropodists should therefore be encouraged to always complete diagnoses.

Further research is required to determine the accuracy of chiropody records, using a randomised selection of patients and their records and in a similar manner to this project, to determine the degree of identity offered, when right or left feet are viewed in isolation and compared to other lesion patterns on feet of that same side.

This study was conducted by necessity on patients records in one Health District and could better be repeated with records from a selection of random Districts.

In testing chiropodists success in identification, in many cases, even though the last treatment notes were made by the chiropodist whose notes were to be used in the test, previous treatment details had been written by other chiropodists. As this was commonplace, the situation was

allowed to stand, as it represented the true situation and did not deviate from protocol. This situation would be unlikely in private practice. Additionally, NHS patients to date are mainly elderly (aged 65 plus), whereas patients of any age receive private and schools treatment. If lesions in younger patients enjoy a different nature and stability, then it would be of interest to conduct these tests in private practice and Schools.

Due to the lack of a suitable regulatory body and possible lack of uniformity in record keeping, the Un-Registered sector has been ignored in this study, however investigations into this sector are indicated. As the results in this project are from elderly subjects only, it could be argued that the findings are limited in their application. However, examination of mortality statistics shows that the elderly appear more prone to death by traumatic injury and accidental causes than other age groups (Table 13), therefore may represent a substantial proportion of cases requiring identification. This susceptibility is probably due to infirmity and reduction of awareness and reaction time from the general ageing process. Younger individuals are better equipped to escape death by trauma and the elderly are at risk of traumatic death in disaster situations. Many elderly are also edentulous and hence less suitable for dental identification.

Table : 13
Mortality Statistics 1989, Sheffield DHA

Cause of Death	Sex	ages										Total	%
		All	1-4	5-14	15-24	25-34	35-44	45-54	55-64	65-74	75-84		
Injury and Poisoning	M	98	1	4	17	18	8	14	12	10	11	3	42.85 %
	F	70	-	-	2	5	7	2	6	15	20	13	42.85 %
Fractures	M	25	-	1	5	2	4	4	4	3	2	-	61.9 %
	F	23	-	-	-	1	1	-	-	9	7	5	61.9 %
Intracranial + Internal Injuries Including Nerves	M	19	1	2	4	3	1	3	1	1	2	1	37.93 %
	F	10	-	-	1	-	2	-	-	1	4	2	37.93 %
Burns	M	2	-	-	-	-	-	-	-	-	2	-	100 %
	F	6	-	-	-	-	-	-	-	-	2	-	100 %
Drowning	M	3	-	1	-	-	-	-	-	1	1	-	40 %
	F	2	-	-	-	-	-	-	-	1	-	-	40 %
Accidents + Adverse Effects	M	58	4	9	8	8	4	9	6	8	7	3	55 %
	F	49	-	-	1	3	3	3	1	12	17	12	55 %
Motor Vehicle Traffic Accidents	M	28	-	2	8	4	3	5	3	2	1	-	35.6 %
	F	14	-	-	1	1	1	-	-	5	7	-	35.6 %
Motor Cycle Accidents (Drivers)	M	2	-	-	2	-	-	-	-	-	-	-	0 %
	F	1	-	-	1	-	-	-	-	-	-	-	0 %
Motor Cycle Accidents (Passengers)	M	2	-	-	2	-	-	-	-	-	-	-	0 %
	F	-	-	-	-	-	-	-	-	-	-	-	0 %
Accidental Falls	M	10	-	-	-	-	1	1	2	2	3	1	77.77 %
	F	17	-	-	-	-	2	-	4	4	7	-	77.77 %
Suicide	M	23	-	-	6	5	1	3	5	1	2	-	12.5 %
	F	9	-	-	-	-	3	1	4	-	1	-	12.5 %
Homicide	M	1	1	-	-	-	-	-	-	-	-	-	66.66 %
	F	2	-	-	-	-	-	-	-	-	-	-	66.66 %
Injury Undetermined whether Accidental or Purposely Inflicted	M	16	-	-	2	5	3	2	1	1	2	-	27 %
	F	10	-	-	-	2	1	1	2	2	2	-	27 %

Thus, the use of the elderly in this project is justified in terms of accessibility and as an important age group for identification.

The investigation was conducted on subjects presenting both feet for examination. In traumatic death or dismemberment, there is likelihood that only one lower limb is available for identification. A repeat study is indicated involving only one of the subject's feet, chosen at random between right and left, the other foot remaining hidden to the investigator.

Analysis of the study demonstrated a difference between Brighton and Sheffield in the success rate of identification, with significantly greater success in Sheffield. This was not expected. Despite a request that reasons for failure to identify be listed, 87 such failures had no reason notes, hence detailed analysis of this information was not possible. Reasons for this difference could include overall differences in record keeping standards, general foot pathology encountered (with Sheffield being a predominantly working class inner city area with deprivation, whereas Brighton maintains a more middle class population), or in effectiveness of treatment policy between the two Districts, with greater success in treatment resolving foot symptoms and causing subsequent difficulty in identification from past records. Other reasons could include difficulty in understanding methods

involved, or Chiropodists in one District qualifying at predominantly different schools than the other, where possibly less specific systems of notation are taught, or the length of time that participating Chiropodists had been qualified, with possible lowering in record keeping standards with the length of time qualified. Another factor is that in 1985, in Sheffield, a Memorandum was issued to staff requesting improved standards in record keeping which could have had the effect requested. Verbal confirmation was given from a Brighton chiropodist that no such memorandum had similarly been issued in that District. The same verbal 'interview' also confirmed that Brighton is predominantly middle class and that all participating chiropodists attended Southern Schools of Chiropody (whereas all participating Sheffield chiropodists attended Northern Schools).

Conversely, the same interview confirmed that all chiropodists whose records were used in the tests had been qualified approximately four years - a similar length of time to participating Sheffield chiropodists and that all Brighton chiropodists understood the instructions well, discounting the difference in length of times qualified and difficulties in understanding the methods involved as reasons for the differences observed. Examination of the identification failures in Brighton showed that the most common reasons for failure were that lesion patterns observed were of common occurrence, representing little

pathology (9 of the reasons given) and poor past record-keeping, either from inaccuracy or incompleteness (10 of the reasons given). As there were 148 failures with no reason for failure given, or suggested, no firm conclusions can be drawn on the difference between the Districts, but from the limited information obtained, a combination of differences in foot pathology according to socio-economic distribution and differences in note-keeping standards (influenced by notation systems used and the Sheffield 1985 memorandum) appear the probable reasons. A test involving Sheffield chiropodists and Brighton records and vice-versa, along with other Districts would be useful here.

The 2 test also demonstrated significant differences in Test 1 between identification from notes last made by the identifying chiropodist and identification from another's notes, but no such difference in Test 2. Whereas chiropodists would be expected to understand their own records better than another, the difference in Test 2 was not expected. This may be because when there is certain knowledge that the correct card is one of five, it is somewhat easier to reach a decision over the correctness of a card. The four other possible cards may contain exclusion factors, thus introducing identification by exclusion of the other cards.

When the results were examined for differences in chiropodists success in identification, Sheffield and

Brighton were examined separately to eliminate bias from the differences observed between the two Districts. Sheffield chiroprodists identified with similar success rates as demonstrated by the 'test, however for Brighton, chiroprodist 8 identified with significantly greater success in Test 1 than the other chiroprodists. This chiroprodist identified correctly throughout Tests 1 and 2 (although undertook too few identification tests in Test 2 for significance to be recorded). This may have been due to greater identification abilities, although another explanation is that this chiroprodist may have deviated from protocol in some way. A future closely monitored repeat test would ascertain whether this chiroprodist's results could be repeated and verify this apparent expertise. Verbal 'interview' with another Brighton chiroprodist confirmed that chiroprodist 8 maintained very high and conscientious clinical standards and was unlikely to deviate from protocol, thus indicating that an expertise in this procedure is likely.

Conversely, chiroprodist 10 in Brighton proved significantly less successful than the other Brighton chiroprodists in Test 2. This may have been due to that chiroprodist having less ability than the others with respect to Test 2, possibly the presence of other cards to select from confusing that individual's decision-making process. Another possibility for this significant difference could have been an abundance of poorly written records from which

to base a decision.

The most likely explanation however, is as follows:

Due to postal problems, chiroprapist 10's results became missing and a copy had not been taken prior to posting. Chiroprapist 10 was duly contacted and relayed the results from memory. The Test 2 results may have been remembered incorrectly, thus accounting for the difference. This possible inaccuracy, while not large enough to account for the differences between Sheffield and Brighton, could account for the Test 2 differences between chiroprapist 10 and the other Brighton chiroprapists. Re-testing would determine whether these results would be repeated, but as voluntary help was given by all, to request a re-test would be unreasonable.

From the reasons given for failure to identify (Table 11), the factors upon which successful identification are based can be assimilated. Assuming the feet are intact and chiroprapy records available, successful identification is dependent on:

1. Adequate foot pathology of the subject.
2. Legibility of the chiroprapy record.
3. Accuracy and completeness of records.
4. Understanding of abbreviations used.
5. Stability of recorded pathology.
6. Care on behalf of the identifying chiroprapist.

The importance of preparing truthful and accurate complete

medical records was stated by Berg (Berg R N), with regard to malpractice suits. Correct records are thus essential for identification. The problem of illegible records has also been noted in the past (White K B and Beary J F), when an examination of legibility, comprehension and reading time of patient notes concluded that a considerable portion of most handwritten medical records are illegible. This study confirms that illegibility can be a problem. Further longitudinal studies are required on the stability of recorded pathology. Chiropractors undertaking identification would be enjoying a position of immense responsibility, therefore must take the utmost care to eliminate the risk of examination errors.

Failure to identify due to misunderstanding abbreviations can be attributed to two factors, firstly the use of personal notation and secondly the teaching of different notation at different Schools of Chiropractic. Personal notation should not be used and is discouraged in the NHS. Awareness of the possibility of using chiropractic records in identification may further pressurize chiropractors to end personal abbreviations. The multiple recording systems taught in the Schools of Chiropractic are a hindrance to identification and whereas some chiropractors understand all systems, the situation could delay identification in practice and may concern legal authorities considering the acceptance of chiropractic identification.

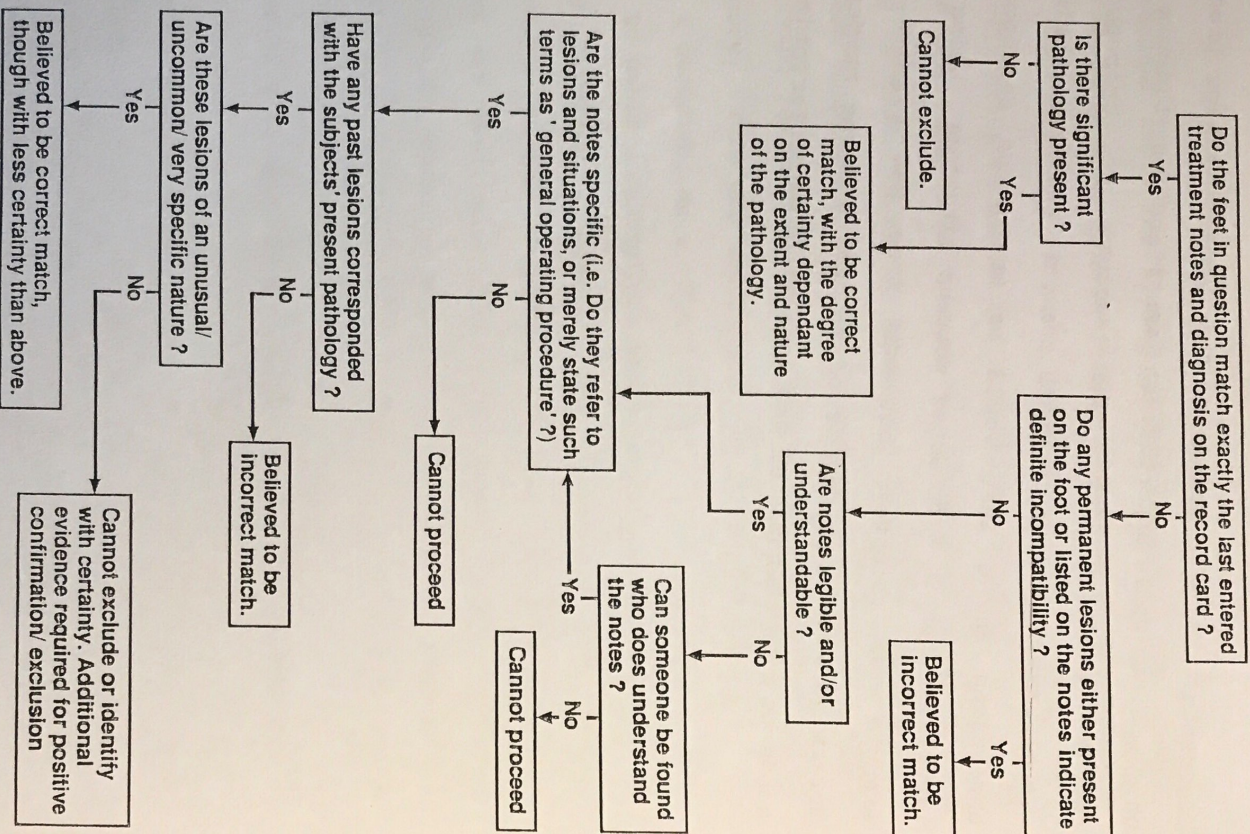
A national recording system is possible and adviseable, with no sensible argument offered in defence of the present situation. The number of correct identification/elimination judgements recorded in these tests was high, with 96.88% of judgements in Sheffield being correct, 73.9% in Brighton, giving 85.65% overall correct judgements. The tests however limited chiropodists to giving Yes/No judgements, not allowing a 'Don't Know' category. This was deliberate, to force chiropodists to make a decision, as a 'don't know' category may have been used to avoid considerable decision-making, as opposed to being genuinely unsure. The percentage of correct judgements should be higher, if identification strength scales are used, similar to that suggested for dentists (Dailey J C), allowing chiropodists to indicate degrees of certainty of identification. This six point scale is as follows:

5. Positive identification within reasonable scientific certainty. Absolute certainty.
4. Very probable, Highly probable, Highly consistent. Most likely.
3. Probable. Consistent with.
2. Presumptive by exclusion.
1. Can't exclude.
0. Mismatch. Unidentified.

Identification from chiropody records can be mapped in

Algorithmic form to summarize the decision-making process chiropodists would undertake in identification (Diagram 2). Further research into the success of chiropodial identification when a strength scale is utilized should be undertaken and a test would be useful of chiropodial identification in a disaster mock-up situation, using for example 100 volunteer patients from NHS clinics, to determine with what degree of success a large number of subjects with chiropodial problems could be differentiated.

Diagram : 2



CONCLUSIONS

Current identification methods are well established. Nevertheless, situations exist whereby current methods can become compromised or useless. Other acceptable identification methods are required in these situations. The foot and chiropody have been neglected in the past with regard to forensic and mass disaster identification, but there has been a recent awareness of this neglect.

Chiropodists note fine detail of foot lesions and pathology in everyday record keeping. Such information can be used in identification. The presence of multiple taught systems of notation and the use of personal notation could hinder identification from chiropody records. The use of personal notation should be discouraged and the implementation of a national recording system is highly recommended, even above the writing of treatment details long-hand, which being time-consuming, may discourage chiropodists from writing thorough treatment details. In the context of identification from chiropody records, a national recording system would only have to be understood by chiropodists - the excellent dental recording systems are pertinent to dentists only.

There is 95% confidence that 4.692% to 7.267% of the U.K. population currently receive chiropody treatment from State-Registered chiropodists. This is a reasonable enough proportion for chiropodial identification to be considered.

As the elderly appear to have more likelihood of suffering death from fire and trauma, and receive a large proportion of chiroprody treatment, a positive bias may exist in that the population more prone to traumatic death also receive a large proportion of chiroprody treatment given.

Chiroprody records appear to reflect at least short-term identity, with stronger evidence of identity being offered by the recording of permanent lesions of the foot (e.g. Onychogryphosis). Further studies into lesion stability are required.

Most chiroprodists appear able to use treatment records in identification with similar degrees of success, within the same District. The difference observed between Sheffield and Brighton was not expected, should be investigated further, and other Districts involved in similar future tests in the light of this finding. It would also be desirable to investigate the outlying chiroprodists with apparently greater and lesser identification abilities, to ascertain the true meaning behind these outlying results.

The success rates of chiroprodists in the identification tests were high, in both tests on a subject in isolation (Test 1) and where separation from other possible individuals is required (Test 2) and may be improved in practice by the use of identification strength scales. Further research should now be undertaken, particularly in

using one foot only to represent traumatic loss of a foot and subsequent identification potential from the remaining foot and a test of a mass disaster mock-up, testing differentiation of a large number of subjects from chiropody records.

The private and Un-Registered sectors should also be investigated.

In view of the high degree of success observed and the possibility of future chiropodial identification, Schools of chiropody should impress on students the need to maintain high standards of record keeping in this context. Basic identification methods are simple and could be taught to students in case they are asked to undertake an identification in later careers. Likewise, working chiropodists should be made aware of the value of accurate records with respect to identification, and encouraged to maintain high recording standards at all times, as identification from poor or incomplete records would be impossible.

It would appear advisable to include a chiropodist with forensic interests on the disaster identification team, to compile, collate and compare chiropodial data on victims, to either be used in place of other identification methods when they have been rendered useless, or to supplement other methods in cases of uncertainty. This study demonstrated that where only one victim requires

identification, identification from ones' own notes is preferred. Thus, in practice, the chiroprapist who made the original notes would be consulted by the Forensic Chiroprapist. A Forensic Chiroprapist could also be placed on the National Data Bank Information systems, to become easily available for consultation in criminal investigation situations.

Forensic chiroprapy appears to be a valid and useful function for the profession. Identification from chiroprapy records could be useful in forensic and disaster situations. Should the method prove successful in practice, it could be seen as the beginning of more extensive involvement of chiroprapy in Forensic Science. Further directions of study could include research into permanent histological changes of 'healed' chiroprastial skin lesions as an aid to identification and research into areas such as biomechanical traits and implications of chiroprastial dermatoglyphics in identification.

Identification from chiroprapy records, either as a supplement to dental identification, or in its' own right, has been demonstrated to be potentially successful and its' adoption by the Forensic Science Agencies as a routine procedure, with chiroprapy data being compiled for all unknown bodies is recommended. The use of an identification strength scale is also recommended and

standardization of notation, and improved care in record keeping would greatly enhance the usefulness and validity of such a system.

REFERENCES

1. Berg R N. The importance of preparing truthful accurate and complete medical records. Journal of MAG 73 1984; p. 35-38.
2. Mystery man's classic suicide. Buxton Advertiser 1990; p.1.
3. Cairns F J, Herdson P B, Hitchcock G C, Koelmeyer T D, Smeeton W M I and Synek B J L. Aircrash on Mount Erebus. Medicine, Science, Law 1981; 21: No.3: p.184-188.
4. Clark D H. Dental identification problems in the Abu Dhabi air accident. American Journal of Forensic Medicine and Pathology 1986; 7: No.4: p.317-321.
5. Dailey J C. Identification strength scale. Journal of Forensic Sciences 1987; 32: No.2: p.317-318.
6. Department of Health, Statistics and Research. Chiropody service statistics for England (1987/88) 1989;
7. Doney I E. Mass disaster identification. Can chiropodists help? The Police Surgeon 1984; 25: p.14-20.