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Title: Australian oral health case notes: assessment of forensic relevance and adherence to recording guidelines

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Short running title – Assessment of forensic relevance and recording

Australian oral health case notes: assessment of forensic relevance and adherence to recording guidelines

Abstract:

Background – Dental case notes record clinical diagnoses and treatments, as well as providing continuity of patient care. They are also used for dento-legal litigation and forensic purposes. Maintaining accurate and comprehensive dental patient records is a dental worker's ethical and legal obligation.

Methods – Australian-registered specialist Forensic Odontologists were surveyed to determine the relevance of recorded case note items for dental identification. A dental case notes sample was assessed for adherence with Odontologist-nominated forensic value and compiled professional record keeping guidelines of forensic relevance. Frequency of item recording, confidence interval, examiner agreement and statistical significance were determined.

Results – Broad agreement existed between Forensic Odontologists as to which recorded dental items have most forensic relevance. Inclusion frequency of these items in sampled case notes varied widely (eg. single area radiographic view present in 75%, CI=65.65-82.50; completed odontogram in 56%, CI=46.23-65.33). Recording of information specified by professional record keeping guidelines also varied, although overall inclusion was higher than for forensically-desired items (eg. patient's full name in 99%, CI=94.01->99.99; named treating practitioner in 23%, CI=15.78-32.31).

Conclusion – Many sampled dental case notes lacked details identified as being valuable by forensic specialists and as specified by professional record keeping guidelines.

Key words: adherence, case notes, dental, forensic, guidelines

Introduction:

In Australia, it is a requirement that all oral health care workers produce and manage dental patient records in line with professional guidelines. Specific recommendations were available to the dental profession through the Australian Dental Association Inc. (ADA) Practical Guides in 2006.¹ The Dental Board of Australia's (DBA) 2010 Guidelines² reflect these and also state that 'dental practitioners must create and maintain dental records that serve the best interest of patients, clients or consumers and that contribute to the safety and continuity of their dental care'. The Australian Health Practitioner Regulation Agency (AHPRA)³ and updated ADA recommendations⁴ similarly endorse these guidelines for dental and para-dental workers in Australia and they are, in effect, mandatory. An approved registration standard for a health profession, or a code or guideline approved by a National Board, is admissible in proceedings under the Health Practitioner Regulation National Law Act 2009³; they can be used against a health practitioner registered by the Board as evidence of what constitutes inappropriate professional conduct or practise for the health profession.

Despite best intentions, the record keeping guidelines that govern the dental profession have, in the past, lacked specificity. As a consequence, the need for individual practitioners to interpret guidelines has led to suboptimal record keeping outcomes. In addition to possible ramifications for patients and care providers, such sub-optimal recording is significantly concerning for Forensic Odontology casework.

The success of human identification by dental means relies on both condition of the unknown deceased's dental remains and the quality and quantity of recorded antemortem dental records available for comparison. To be optimally useful for forensic services, dental case notes need to document the oral health status of a patient in its entirety. Specifically, case notes should be

detailed, accurate and legible. The forensic value of these is heightened when diagnostic and treatment information is supported by inclusion of descriptions and radiographic and/or photographic images of specific features found in the teeth, dental work and other oral and dental structures definitively to link them to the deceased person.^{5,6} In addition, records should be accessible when requested by appropriate authorities and retained for the DBA and ADA-recommended 7-10 years.

To date, there has been no statistical data available regarding forensically-valuable oral-health-item recording in Australian case notes. This study aimed to provide such information by ascertaining recording frequency of dental case note items perceived relevant by Australian-registered specialist Forensic Odontologists for dental identification. There are also currently limited statistical data on how Australian dentists record details in patients' case notes with regard to specific ADA and DBA record-keeping guidelines. Hence, this study further aimed to consider compliance with those of forensic value. The results will be used to encourage dental practitioners to comply with professional record keeping guidelines with specific regard to forensic identification.

Materials and methods:

The project received ethical approval from the Human Research Ethics Committee of the University of Adelaide (HS-2014-098).

All registered specialist Forensic Odontologists in Australia were contacted to participate in an electronic survey of the value of certain information and oral traits in assisting a dental identification (Table 1). Participants were asked to determine which single-category description (Table 2) they would allocate to 41 items on the survey, based on their experience as a Forensic Odontologist. Items with 100% broad agreement (ie. all specialists scored these items in the two

highest categories for forensic relevance to dental identification) were determined, along with calculations for mean, mode and standard deviation (SD) for each survey item.

Additionally, guidelines on clinical dental record keeping from the Australian Dental Association (2006) and Dental Board of Australia (2010) were cross-referenced and assessed by practicing Forensic Odontology staff at the Forensic Odontology Unit of South Australia (FOU of SA) and 9 were deemed to be common and of forensic relevance. For the purposes of this research and easy reference, these guidelines were known as the compiled record keeping guidelines and were itemised as per the Dental Board of Australia's 2010 guideline references (Table 3).

A power study demonstrated that 100 case notes needed to be reviewed to provide a statistically-relevant result. The 100 case notes, randomly chosen from those acquired by the FOU of SA in the period 2008-2013, were assessed with regard to forensic value, based upon the 20 recorded traits that garnered 100% broad agreement from the Forensic Odontology survey. These 2008-2013 case notes were additionally assessed for adherence to the 9 compiled record keeping guidelines of forensic relevance, along with subjective assessment for legibility and accuracy (ie. antemortem information was in concordance with postmortem information). Accordingly, a final checklist of 31 items was used for dental case note assessment.

The primary examiner reviewed each of the 100 case notes to assess whether each item on the final checklist was present or absent. Frequency of appearance of traits was calculated (%), along with the 95% confidence interval (CI) using the modified Wald method.⁷

A second examiner was tasked with re-assessing 20% of the randomly sampled case notes for inter-examiner agreement (Fig 1), with Fleiss' kappa⁸⁻¹⁰ used to determine the degree of precision or agreement between examiners. The first examiner also repeated assessment of 20% of the original 100 case notes (a different case note selection from those assessed by the second examiner) at a one month interval following initial assessment, in order to establish intra-examiner Fleiss' kappa (Fig

2). Fisher's Exact test¹¹ was applied to assess the exact 'p' value only for statistically significant inter- and intra-examiner results.

Results:

There are 27 registered specialist Forensic Odontologists within Australia. During the four week period that the survey was active, a total of 21 completed surveys were received (most within the first fortnight after survey release) and deemed appropriate for analysis. This represented an overall survey response rate of 78%.

There was 100% broad agreement (Likert scores 3 and 4) amongst Forensic Odontologists for 21 out of 41 items listed on the survey for perceived relevance to a forensic dental identification (Table 4). Findings related to frequency of Odontologist-nominated forensically desired traits seen in the sample are also presented in Table 4, with intra- and inter-examiner kappa results (and relevant 'p' values). Here, 75% (CI= 65.65-82.50) of notes contained at least one radiograph of a single area, 56% of case notes contained a completed odontogram (CI=46.23-65.33, inter-examiner $p=0.0001$) and only 14% (CI=8.40-22.25) contained written information about the patient's occlusion.

Findings related to frequency and CI of compiled record keeping guidelines seen in the case note sample, along with intra- and inter-examiner kappa results (and relevant 'p' values) are presented in Table 5. Items such as the patient's full name (99% of case notes, CI=94.01->99.99) and date of birth (91%, CI=83.58-95.38) were recorded frequently. A medical history that was current to within 12 months of the patient's last recorded visit was present in only 40% of case notes (CI=30.93-49.81). Additionally, 25% (CI=17.50-34.35) of case notes contained omissions of documentation related to patient care (eg. written evidence that a radiograph had been taken but was not present within the case notes).

Findings related to perceived legibility and accuracy of dental case notes are summarised in Table 6. Most were both legible (95%, CI=88.54-98.13) and accurate (89%, CI=81.21-93.91). Fig 3 shows an example of poorly legible recording.

Discussion:

Good clinical case notes are sound forensic and dento-legal case notes. Failure to comply with professional record keeping guidelines leaves practitioners open to indefensible litigation actions and can also hinder forensic identification. Accordingly and in this electronic age, it is now possible to realistically suggest maintaining dental case notes indefinitely (ie. beyond the recommended 7-10 years), as it can be in the best interest of both practitioners and the public.

The response rate of the Forensic Odontologist survey was 78% and the researchers considered this to be a representative sample of specialists throughout Australia. Failure to respond may have been due to lack of interest in participation, the short time available for survey response or personal circumstance eg. on holidays during the survey period. This is unlikely to have influenced the results.

Twenty one surveyed items were classified to as either valuable or useful to the identification role of specialists. Many of these items have long been considered standard aids to comparative dental identification.^{12,13} The remaining twenty items on the survey did not return results upon which all surveyed specialists agreed. This may be a reflection of factors including:

- differing state policies regarding sourcing dental records for comparative dental identification. For example, in South Australia the police complete initial investigation and collection of information regarding the deceased's suspected identity, based on circumstantial evidence, interviewing and consolidation of facts. As a result, in that jurisdiction the Forensic Odontologist may not be particularly concerned about details necessary to source records (eg. person's health fund name);

- information not being seen as ‘individual’ and therefore inconclusive for use in a comparative dental identification. For example, amalgam tattoos are reportedly present in a relatively high proportion (5%) of the Australian population¹⁴ and may not be noted as unusual by clinicians;
- information seen as more relevant to specialty groups other than Forensic Odontologists, such as some common non-dental or soft tissue pathologies;
- details seen as preferred, rather than necessary (eg. use of FDI notation system); or
- the individual Forensic Odontologist’s career case work experience where either positive or negative experiences related to certain aspects of patient records could significantly influence their views.

Case notes sampled demonstrated good recording of patient details (guideline reference 3.1.a). A medical history form (3.1.b) was present in 68% (CI=58.31-76.35) of case notes. Improved adherence to this guideline is required. Almost all (99%, CI=94.01->99.99) reviewed case notes met the requirement for guideline 3.2.a.i – clear documentation describing the date of visit. Eighty five percent of case notes sampled described identifying details of the practitioner providing treatment (3.2.a.ii), with 23% (CI=15.78-32.21) actually naming a practitioner and 62% (CI=52.20-70.91) featuring a suspected internal practice identifier which is much more challenging to follow up in a forensic circumstance that may occur years after the dentist has left the practice.

Concerning was the number of odontograms that were found to be either entirely or partially (29%, CI=20.98-38.57) incomplete. Even a pre-printed odontogram lay-out (ie. suggestive of the intended details) was not enough to encourage 9% of dental care providers to make basic documentation of a patient’s previous dental history.

When *each single* detail (3.2.a.vi) recorded can add weight to a decision regarding the forensic identity of an individual, the omissions highlighted in the current study are concerning. Of particular concern was the low level of recording of tooth anomalies, such as changes to

morphology, positioning and obvious wear patterning (only recorded 17% of the time, CI=10.80-25.65). In a society where many individuals now have very low levels of dental disease and treatment and hence limited 'individualising' features, recordings of other traits is all the more important.

Ninety one percent of case notes (CI=83.58-95.38) described the patient's presenting complaint (3.2.a.iv) but only 44% (CI=34.67-53.77) documented the treatment plan proposed (3.2.a.viii). Documentation of discussions of the risks and benefits of treatments and alternatives could surely become a dento-legal matter if the patient's expectations are not met.

Guideline 3.2.c requires documentation about clinical details related to radiographs and other diagnostic data. Many patients (25%) had no radiographs contained within their case notes. Only 39% (CI=30.03-48.81) of case notes contained a panoramic radiograph. Only 2% (CI=0.11-7.44) of patient records contained photographs (intra- or extra-oral), despite the high prevalence of intra-oral cameras within dental practices. Issues such as failure to label a radiograph with the correct patient name (25% of the time) or a date that matched that recorded in the written documentation (36%) are simple, easily avoided errors. When these types of issues arise, clinical treatments and the task of forensic identification may be compromised. Identification is made more time-consuming, as consideration must be given to whether the individual can truly be excluded from identification, or whether the postmortem digital images allow inference that antemortem data was recorded incorrectly.

Though few dental case notes (5%) from the current sample were truly illegible, it is clear that clinical (eg. treatment provided on the wrongly identified tooth) and forensic identification issues could arise. Having to work to decipher details from case notes can decrease the rate of progress of a forensic case.

Accepted Article

There was a number of limitations with this study. The survey sample size was small. Though the survey regarding opinions was sent to all registered Forensic Odontologists throughout Australia, in reality this only meant a possible 27 participants. Lack of specificity of survey questions may have also been a limitation. The intended closed-endedness of the items on the survey may have led to some Odontologists classifying items differently than if further information had been provided and so may not have been truly indicative of their personal experience. Although the case notes may potentially have been generated anywhere in Australia, the sample was drawn from only one state (South Australia), as this was accessible to the researchers. These case notes were considered a representative sample of the Australian oral health workforce.

A further limitation related to the classification of reviewed case notes. Items in case notes were classified simply as 'present' or 'not present'; no consideration was given to whether or not the particular item may have been relevant to the individual case, with the assumption made that all case notes could have contained the sampled characteristics. For example, a patient may have had no individual tooth anomalies and this was why none were recorded in their case notes. Similarly, the fact that only 39% of case notes included a panoramic radiograph is more likely to have been a reflection of the number of patients for whom this radiograph was deemed appropriate to their clinical treatment requirements, rather than the inference that the remaining 61% of patients should have had one (eg. as a screening tool) but did not. As such, the study cannot comment on the relevance of all items on the checklist to individual cases, only whether they were present or absent for each sampled case note.

Kappa values were not identical, indicating some issues with classification of items in case notes. As sampled case notes were often lengthy and time-consuming to comprehend, incorrect classification of items occurred, both at intra- and inter-examiner level. It is possible that various items for the case note review were not appropriately defined. For example, whether there was a 'record of the patient's presenting complaint' recorded a fair kappa value for intra-examiner

agreement – this may have been due to differing examiner opinions regarding what this statement meant. It is presumed that the error rate could have been considerably higher if training and discussion regarding classification definitions of each checklist item had not occurred. A ‘background’ error rate may also exist, despite the training and enthusiasm shown by the examiners.

Conclusion:

In this study, the degree to which a set sample of dental case notes contained information perceived by Australian Forensic Odontologists as relevant to identification of deceased individuals was determined. Additionally, the level to which dentists were complying with compiled 2006 ADA and 2010 DBA forensically relevant record keeping guidelines was assessed. These aspects of dental case notes had not been reported before in Australia. Results from this study indicate that changes to current recording practices should be encouraged in order to enhance the specificity and value of oral health case notes. The development of an educational programme is recommended to help manage these discrepancies. The challenge remains to identify a standard protocol that can be easily taught, recalled and routinely carried out by dental practitioners.

Acknowledgements:

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FIGURE 1 – Fleiss' kappa category distribution for inter-examiner agreement related to presence of checklist items in case notes.

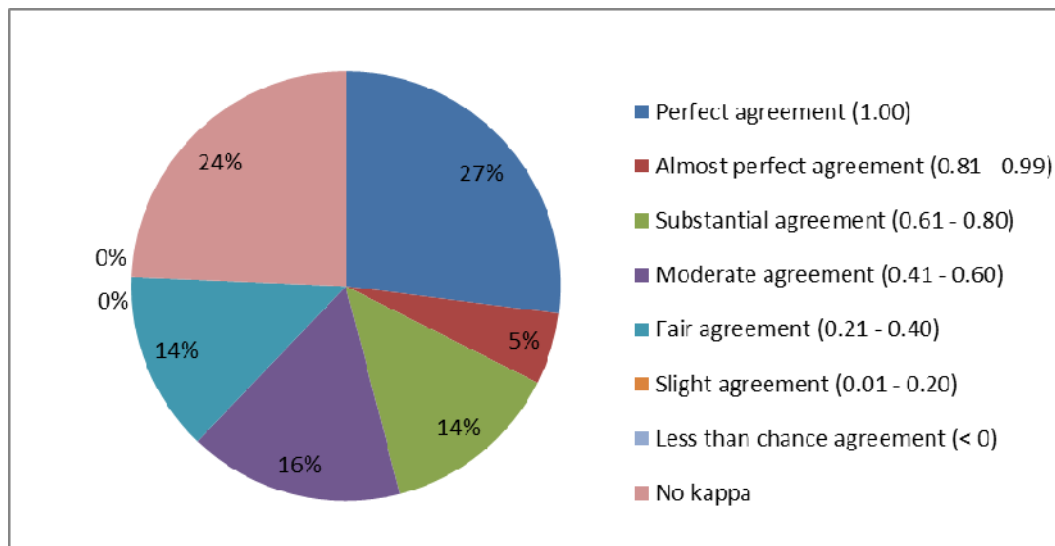


FIGURE 2 – Fleiss’ kappa category distribution for intra-examiner agreement related to presence of checklist items in case notes.

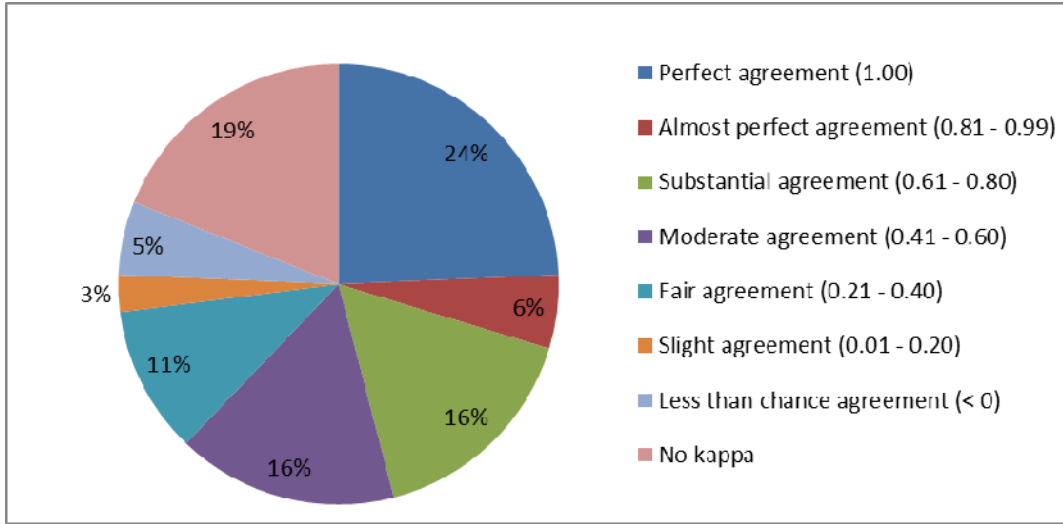


FIGURE 3 – Example of poorly legible writing in the case note sample.

DATE	TREATMENT PARTICULARS	QUOTE	
13.6.96	examination; pt concerned about yellowing teeth → for appt. C. DT for clean, OHI, F- treatment; then back to HSE for assessment of yellowing teeth	all	
27.6.96	in clinic. ↓ amt. coke. Post procedure (P) V. Concerned + consulted re. about repair of teeth. Prescribed re. bleaching. Inst. F' (0.1) TBI - this is PC - 6/12. 6/12 DT/MB		46
27.6.96	cancelled	-	
June 98	PR sent.		

TABLE 1 – Items that could be contained within case notes that were assessed by Australian-registered Forensic Odontologists for relevance in assisting dental identification of deceased individuals.

Patient and dentist details	Soft tissue features
Patient's next of kin details	Presence of piercings eg. tongue, lip
Name of patient's workplace	A record of amalgam tattoos
Name of patient's health care fund	A record of the palatal rugae pattern
Patient's drivers licence number	A record of visible body tattoos
Name of patient's treating dental technician	A record of extra-oral features or scarring
Name of patient's previous dentist	The presence/description of tori (palatal or lingual)
Teeth present	Radiographs
A completed odontogram	Radiograph of a single area eg. periapical view
An incomplete odontogram	Panoramic radiograph or full mouth survey
A current odontogram	Extra-oral radiographs eg. lateral cephalometric
An old odontogram	Three dimensional scans
Dental notations using FDI	
	Photographs
Intra-oral hard tissue features	Intra-oral photographs of a single area
A record of fractured teeth	Intra-oral photographs of a full arch
A record of tooth wear patterns	Photographs of models of occlusion
A record of tooth anomalies eg. supernumerary, dilacerations	Photographs of appliances eg. orthodontic retainers, mouthguards
A record of hypomineralisation eg. fluorosis	Photographs of partial dentures
Presence of tooth jewellery	Photographs of complete dentures
	Photographs of complete dentures in patient's mouth
Occlusion and appliances	Other extra-oral photographs
A written record of occlusion	
A written record of rotated and/or crowded teeth	Other
Retained models of occlusion	A treatment description of a limited area
Actual dental appliances eg. nightguard, mouthguard	
Patient's full dentures are labelled with full name	
A description of the design of partial dentures	

TABLE 2 – Scoring dental items contained within a case note on a Likert system, based on perceived relevance to dental identification by Australian-registered Forensic Odontologists.

4	Valuable	Information considered highly important to establish identity
3	Useful	Information which may partially assist in establishing identity, or lead to the acquisition of further information which may partially assist to establish identity.
2	Undecided	Unsure as to whether the information would add weight to establishing an identity.
1	Not required	Information not seen to add weight to establishing identity.

TABLE 3 – Forensically-relevant record keeping guidelines common to both the 2006 ‘Australian Dental Association’s Guidelines for Good Practice on Patient Information and Records’ and The Dental Board of Australia’s 2010 ‘Record keeping guidelines’. These recommendations were known as the ‘compiled record keeping guidelines’ and, for the purposes of this research and ease of explanation, were itemised as per the DBA guideline references shown.

‘The following information forms part of the dental record and is to be recorded and maintained, where relevant’:

3.1.a	Identifying details of the patient
3.1.b	Completed and current medical history including any adverse drug reactions
3.2.a.i	Clinical details for each appointment, with clear documentation describing the date of visit
3.2.a.ii	Clinical details for each appointment, with clear documentation describing the identifying details of the practitioner providing treatment
3.2.a.vi	Clinical details for each appointment, with clear documentation describing findings and observations
3.2.a.iv	Clinical details for each appointment, with clear documentation describing the presenting complaint
3.2.a.viii	Clinical details for each appointment, with clear documentation describing the treatment plan and alternatives
3.2.a.x	Clinical details for each appointment, with clear documentation describing all procedures conducted
3.2.c	Clinical details regarding radiographs and other diagnostic data

TABLE 4 –All surveyed Australian-registered Forensic Odontologists agreed that the following 21 items, when contained within case notes, were valuable or useful to a forensic dental identification. The item ‘labelled full dentures’ was excluded from the subsequent portion of the study. Likert mean (\bar{x}), mode (Mo) and standard deviation (s), for ‘Odontologist-nominated items’ are presented. Also presented are frequency inclusion and 95% confidence interval of items in the case note sample, along with intra- and inter-examiner agreement.

Patient and dentist details							
Name of previous dentist	3.6	4.0	0.49	23	15.78-32.21	0.474	0.857 (p = 0.0010)
Teeth present							
A completed odontogram	4.0	4.0	0.00	56	46.23-65.33	0.694 (p = 0.0045)	0.900 (p = 0.0001)
An incomplete odontogram	3.3	3.0	0.47	29	20.98-38.57	0.571 (p = 0.0320)	0.794 (p = 0.0005)
A current odontogram (within 12 months of death)	3.95	4.0	0.21	22	14.94-31.13	1.000	0.318
An old odontogram	3.5	4.0	0.50	54	44.26-63.44	0.898 (p < 0.0001)	0.529 (p = 0.0307)
Intra-oral hard tissue features							
Record of tooth anomalies	3.9	4.0	0.35	17	10.80-25.65	0.483	0.780 (p = 0.0012)
Occlusion and appliances							
Written information about the patient’s occlusion	3.2	3.0	0.41	14	8.40-22.25	0.467	0.500
Retained models of occlusion	3.95	4.0	0.21	1	<0.01-5.99	1.000	-
Photographs of occlusion or models of occlusion	3.7	4.0	0.47	2	0.11-7.44	1.000	1.000
Written information of (or an actual) dental appliance	3.9	4.0	0.35	28	20.10-37.52	0.733 (p = 0.0049)	0.733 (p = 0.0049)
Soft tissue features							
Record of notable extra-oral features or scarring	3.1	3.0	0.35	1	<0.01-5.99	-	-
Radiographs							
Radiographic view of a single area	3.9	4.0	0.31	75	65.65-82.50	1.000	1.000
Panoramic or full mouth survey	4.0	4.0	0.00	39	30.03-48.81	1.000	1.000

radiographs							
Extra-oral head and neck radiographs	3.8	4.0	0.39	3	0.65-8.83	1.000	1.000
3D scans	3.7	4.0	0.45	0	0.00-4.44	-	-
Photographs							
Intra-oral photographs of a single area	3.7	4.0	0.47	2	0.11-7.44	0.643	1.000
Intra-oral photographs of a full arch	3.8	4.0	0.39	2	0.11-7.44	1.000	1.000
Photographs of partial dentures	3.5	3.0	0.50	0	0.00-4.44	-	-
Extra-oral photographs of patient	3.5	3.0	0.50	2	0.11-7.44	1.000	1.000
Others							
Treatment description of a limited area	3.6	4.0	0.62	99	94.01-99.99	-	-
Labelled full dentures	3.9	4.0	0.31	-	-	-	-

TABLE 5- Summary of frequency and confidence interval of forensically-relevant compiled record keeping guideline items seen in case note sample. Intra- and inter-examiner agreement are also presented.

3.1.a	The patient's first and last name?	99	94.01	-	>99.99	-	1.000
	The patient's full date of birth?	91	83.58	-	95.38	1.000	0.459
3.1.b	A medical history form?	68	58.31	-	76.35	0.875 (p = 0.0004)	1.000
	A medical history form current to within 12 months of the last recorded visit?	40	30.93	-	49.81	0.490	0.468
3.2.a.i	Dated written entries?	99	94.01	-	>99.99	-	-
3.2.a.ii	A possible internal practitioner identifier?	62	52.20	-	70.91	0.762 (p = 0.0022)	0.588 (p = 0.0166)

	The name of the treating practitioner?	23	15.78	-	32.21	0.385	0.294
3.2.a.iv	Details of the patient's presenting complaint?	91	83.58	-	95.38	0.000	0.241
3.2.a.viii	A comprehensive care treatment plan?	44	34.67	-	53.77	0.300	0.255
3.2.a.x	Information about treatment carried out in a limited treatment area	99	94.01	-	99.99	-	-
3.2.c	Dental radiographs all labelled with correct name?	75	65.65	-	82.50	0.773 (p = 0.0158)	0.780 (p = 0.0012)
	Dental radiographs labelled with date that matches written documentation?	64	54.22	-	72.74	0.625 (p = 0.0139)	0.583 (p = 0.0194)
	Any omissions of documentation related to patient care or a procedure eg. written evidence that a radiograph was taken but radiograph not present in record?	25	17.50	-	34.35	0.286	0.400
	Intra-oral or extra-oral photographs	2	0.11	-	7.44	1.000	1.000

TABLE 6 – Summary of frequency and confidence interval of case notes displaying legibility and accuracy in the sample. Intra- and inter-examiner agreement results are also presented.

Legible?	95	88.54	-	98.13	-0.071	-
Accurate (ie. are there overt differences between the antemortem and postmortem examination findings or are they explainable)?	89	81.21	-	93.91	0.318	1.000