

C.A.D. Bulletin

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Editor's message

Assalamualaikum and Salam Sejahtera,

Welcome to the third issue of CAD Bulletin. In this issue, we are pleased to publish five audit reports on various topics that range from waiting time and clinical records to cross infection control.

Clinical audit is a quality improvement process; often described as a cycle. In order to evaluate improvement, the cycle of initial auditing, implementing change(s) and re-auditing must be complete. Thus, it is very important to re-audit previously done audit projects.

CAD hopes to receive more audit proposals especially on re-audit of previous projects in the near future.

Dr. Wardati Yakob
Editor-in-chief

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EDITOR IN-CHIEF:

Dr. Hjh. Wardati Sahimin binti Hj. Yakob

CO-EDITORS:

Dr. Grace Ang & Dr. Jacqueline Keasberry

Advice sheet 1: Guidelines on Planning and Conducting an Audit

Aim of auditing :

To **improve the standards** and **clinical outcomes** of patient **care** by the **systematic review** of current practice.

1. Identify the **topic** that will review current care that is being provided. Topic should be **realistic** and **measurable** (so will allow improvement in clinical practice; increase efficiency and/or be cost effective).
2. **Check with Clinical Audit Division** (by sending email to: angjess@yahoo.com; grace.ang@moh.gov.bn; wardati.yakob@moh.gov.bn; jacsenyum@gmail.com and jacqueline.keasberry@moh.gov.bn that someone else is not already conducting the same/ similar audit in your area of interest. However if there are, you can either collaborate with them, change your audit sample or audit another matter. CAD may be able to provide you with further advice and suggestions on your project.
3. Conduct **literature search** at library, journals, internet e.g. <http://scholar.google.com/> and <http://www.ncbi.nlm.nih.gov/pubmed/>, <http://www.doaj.org> or via RIPAS library subscriptions. Other avenues e.g. Medline or Cochrane – may require payment, unless RIPAS has access. Often we can access abstracts for free. If the author has a contact address, you may write directly to the author and request a copy of the article from them.
4. **Set the standard** you wish to compare against. The literature search may provide the internationally accepted standards for what it is you wish to measure/ review/ compare against. If there is none, you and your team may set an acceptable standard according to current best practices. Example standard: (a figure e.g. 80)...% of (whatever you are measuring) should (comply with whatever the ideal standard/ procedure is).
5. **Identify the criteria** which you will use to measure your performance against the standard set.
6. Decide on **inclusion and exclusion criteria**, if appropriate.
7. Decide how you will **measure the data**, with appropriate definitions for the terms you use, so that others can understand your process.
8. Decide if the data in the audit can be collected **retrospectively** or **prospectively**.
9. **Sample size** – on average you will require 30 -100 subjects/cases/items in your audit, so your sample size has to be appropriate. Too small a sample size means you cannot get much useful information.
10. Decide on the **time frame** for data collection – ideally audits should be completed within 6 months.
11. Try to **minimize bias in sample selection**. Be aware of time bias e.g. results collected in certain calendar months may differ from another period. Operator bias may exist as well.
12. Design the **data collection sheet**. Trial it. The data collection sheet should measure what you want to measure and be easy to fill (to encourage people to participate with you).
13. Decide **who** will be involved.
14. Write your proposal and submit to as **doc/docx** document to Clinical Audit Division via email to: angjess@yahoo.com; grace.ang@moh.gov.bn; wardati.yakob@moh.gov.bn and jacsenyum@gmail.com jacqueline.keasberry@moh.gov.bn titled as Audit proposal from (your name) ASAP. The Clinical Audit Division will advise on necessary improvements to your proposal, so please allow **at least** a month for this process before your planned start date.

15. Your proposal should broadly follow the headings: COVER PAGE, TITLE, INTRODUCTION, AIMS, OBJECTIVES (if appropriate), STANDARDS and MATERIALS AND METHODS, as stated in 'Guidelines on Reporting Audit Results to Clinical Audit Division'.
16. After CAD has commented on your proposal and any necessary improvements have been

made, proceed with your audit. **Collect data and analyse** – usually simple descriptive statistics will be sufficient. Audit is NOT research. (but your Results may lead to it)

17. **Report** on the results. Refer to **Advice Sheet 2: Guidelines on Reporting Audit Results to Clinical Audit Division**.

Advice sheet 2: Guidelines on Reporting Audit Results to the Clinical Audit Division

Audit reports need to be assessed by the Clinical Audit Division for verification before you may claim CPD points and be issued a certificate to indicate completion. The accepted audits will be regularly compiled and published for department distribution.

(1) Document submission

- Submission to the Clinical Audit Division are best submitted via email in doc/docx to grace.ang@moh.gov.bn; angjess@yahoo.com; wardati.yakob@moh.gov.bn; jacsenyum@gmail.com and jacqueline.keasberry@moh.gov.bn
- A cover letter should accompany each submission stating the **name, clinic and contact details** of the **lead auditor and co-auditors**.
- Please ensure that all named co-auditors have read and approved the report in its entirety before submission.
- It is a good idea to ask a couple of people not involved with your audit to read through your report before submission. This can help bring to attention aspects of the audit which requires further clarification. Often what is clear/obvious to the auditor may not be clear to the other readers (not involved with the project).

- (2) The completed audit is expected to broadly follow the following headings:

- **COVER PAGE:** To include project title, unit/department, authors and date.
- **TITLE:** This should be succinct and an accurate reflection of the audit.
- **INTRODUCTION:** To include rationale and why there is a need to undertake the audit.
- **AIMS:** This is usually reflective of the title.
- **OBJECTIVES:** If appropriate, you may include a specific list of objectives for your audit.
- **STANDARD(S):** Should be quoted if available. If unavailable, standards should be based on current best practices.
- **MATERIALS AND METHOD/METHODOLOGY:** This should provide a clear explanation of the audit process so that readers can understand what you did. It should include the audit period, sample size, sample selection, data to be collected, any relevant definitions of terms you used, template of the data collection sheet, any inclusion or exclusion criteria as well as the method of data analysis.
- **RESULTS:** This should logically and systematically report your findings according to your stated aims and objectives. Please avoid simply repeating findings shown by

graphs/charts used, however clarification can be given if necessary.

i. Graphs or charts should

- a. be in Excel 2010 or earlier format;
- b. have a concise accompanying legend e.g. Figure 1. Number of mouthguards; and
- c. be quickly and easily understood and be used to provide clarity to the results where description by text would be overly complicated.

Ideally limit graphs and charts to what is necessary to provide clarity to the report. Maximum 2-3 per report.

ii. Tables should

- a. also be in Word 2010 or an earlier format; and
- b. have a concise accompanying legend e.g. Table 1. Demographics of patients in each district.

• **DISCUSSION:** If appropriate you should discuss the strengths and weaknesses of your audit. Discuss the results, reasons for the results, with reference to other results published/ reported elsewhere, if available. If you have failed to meet the standard set, identify reasons for this.

• **CONCLUSIONS:** This provides a summary of your findings.

• **RECOMMENDATIONS/PLAN:**

- If you **meet the standard set**, congratulations.
- If you have **failed to meet the standards** set, suggest plans to be taken to improve and/or change the practice as necessary. Decide when you will implement these changes.
- **As part of the audit cycle**, irrespective of whether you meet or do not meet the standard set, please plan to re-audit after a suitable time interval to check that you are achieving the set standard, or, you may decide to set a higher (but still realistic/ reasonable) standard to achieve.

• **ACKNOWLEDGEMENTS:** If applicable.

• **REFERENCES:**

- i. Authors are responsible for accuracy and appropriateness.
- ii. References are not compulsory but should be used if appropriate.
- iii. There should be no more than 15 references.
- iv. In the text, references are by author and year of publication e.g.standards (Edwards, 2010).
- v. References are listed alphabetically in the Harvard format e.g.

➤ *For journal articles:*

Rosenbaum C. H. and Barton D. H. (1978) Use of a continuing health history in dental practice: a survey. *American Society of Dentistry for Children Journal of Dentistry for Children* 45 (5):371-375

➤ *For internet accessed references:*

Liverpool University Dental Hospital guidelines (2012) available from <http://www.rlbuht.nhs.uk/OurHospitals/Documents/Liverpool%20University%20Dental%20Hospital%20Referral%20Guidelines.pdf> [Accessed 8th November 2013]

➤ *For book reference:*

Smith, S & Webb, W. (1997) *A guide to selling*. 2nd edn. Edinburgh: Churchill Livingstone

NOTES:

1. It is best to submit your completed audit write up as early as possible. If you wish to claim CPD points for your audit towards the end of the CPD year, please be aware that CAD members require time to go through your audit report. Should your initial draft require amendments or corrections, the final approval for CPD points claim may fall AFTER the CPD cycle, i.e. it can be claimed only for the next CPD cycle.

2. After the final approval, please re-submit the revised report by email and provide a bound hard copy.

GOOD LUCK and feel free to contact any of the members of Clinical Audit Division for further advice and help.

Waiting time of patients attending Primary Oral Care Services in National Dental Centre during Off-peak and Peak periods in June 2012**

¹Dr. Hajah Noryagandi binti Haji Abu Bakar and ²Dr. Haji Amirul Rizan bin Haji Mohamed

¹Division of Primary Oral Care Services, ²Research and Development Division

INTRODUCTION

In any health service setting, long waiting times has a negative effect on public perception of the service, especially in terms of the efficiency of the service itself (Buhaug, 2002). In Brunei Darussalam, patients attend the Primary Oral Care Services for various reasons which varies from just a routine dental check-up, to 'emergency' cases with swelling, severe pain, trauma etc. These patients are seen on a 'first-come-first-served basis'.

When a patient attends the Primary Oral Care Services at the National Dental Centre (NDC), he/she would approach the registration counter for a queue number which is then clipped to the dental appointment card/identification card and placed in the box provided at the registration counter. The receptionist retrieves the patient's case notes from the Records Room and the patient's details are manually noted into a register. Following this, the patient is requested to pay the registration fee, a receipt is issued and the patient then waits to be called by the Dental Surgery Assistants (DSA). Meanwhile, the case notes are taken to a separate area where they would be collected by the DSA when a dentist is available to attend to the patient.

This audit has never been recorded in the NDC. Therefore, it would be interesting to determine the average waiting time of patients attending the Primary Oral Care Services in the NDC. The findings from this audit would provide useful information to the Primary Oral Care Services and the Department of Dental Services as a whole.

AIM AND OBJECTIVES

The aim of this audit was to determine the average waiting time of patients attending the Primary Oral Care Services in the National Dental Centre during Off-peak and Peak periods.

The objectives of the audit were:

1. To compare the average waiting time during Off-peak and Peak periods.

2. To compare the average waiting time for registration, and between registration and when the patient is first called by the DSA during Off-peak and Peak periods.
3. To determine the average total waiting time in relation to the number of dental officers on duty.

STANDARD

To date, there is no World Health Organization (WHO) or International waiting time standard that is available to be used as comparison for this audit. However, the Health Authority of Anguilla had sought patients' opinion on waiting time for those who did not have appointment, as part of their continuous quality improvement programme. In the Anguilla analytical report (2005), the patients considered a waiting time of more than two hours as "much too long", whereas waiting time of one to two hours was designated as "acceptable". For the purpose of this audit, the waiting time standard was set as: 80% of patients who do not have appointments should wait 90 minutes or less before first called by the DSA.

MATERIALS AND METHODS

This was a cross-sectional study of patients' waiting time in a convenient sample of adult patients attending the NDC in Berakas. All patients above 16 years old were included except patients who had appointments. The data collection periods were from 4th to 9th June 2012 for five consecutive working days (Off-peak period) and 11th to 16th June 2012 for five consecutive working days (school holidays- Peak period).

A form* was filled by the receptionists and DSA for each attendee. The receptionists noted the followings:

- 1) Arrival Time - the time when the patient took a queue number from the receptionist's counter
- 2) Registration - the time when the patient's name was called by the receptionist to pay the registration fee

* Please see note on page 43

** This audit was carried out prior to the implementation of BruHIMS

and the DSA noted the followings:

- 3) First Called by DSA - the time when the DSA first called the patient to be seen by the dentist
- 4) Patient leaves - the time when the patient left the surgery after receiving treatment
- 5) Types of treatment received- such as: check up only, scaling, filling, pulp extirpation, extraction, repair denture, referral to other clinics, radiograph taken
- 6) Patient opinion on waiting time (asked before treatment started)

Registration Time was defined as the length of time (in minutes) between arrival time and registration. **Total Waiting Time** in this study was defined as the length of time (in minutes) from when the patient took a queue number (**Arrival Time**) until the time the patient was first called by the DSA. A second form* was filled by the audit assistant, Masni binti Haji Ismail, at the end of each day, noting the total number of patients and dental officers.

Data checking and analysis

Before starting the audit, all members involved in collecting the data were briefed and detailed explanations were given on how to fill in the form. Any confusion was rectified. During the audit, all collected data was checked by the principal investigator at the end of each day to ensure all the data were entered correctly. All completed forms were duplicated and stored separately. Data was entered into a Microsoft Excel spreadsheet, and subsequently analysed using descriptive statistics.

RESULTS

Analysis of participation rate

Six hundred and ninety-seven patients attended during the audit period, but only six hundred and sixty six were available for data analysis (16 forms were missing and 15 forms were incomplete). Two hundred and ninety-two forms from the Off-peak period and three hundred and seventy-four forms from the Peak period were available for analyses (Table 1).

Table 1. Overall response rate (brackets contain percentages)

Date	Total number of forms received	Number of Missing forms	Number of forms with Incomplete data	Total number of patients
04 / 06 / 2012	62 (8.9)	1 (0.1)	0 (0.0)	63 (9.0)
05 / 06 / 2012	55 (7.9)	1 (0.1)	1 (0.1)	57 (8.2)
06 / 06 / 2012	60 (8.6)	1 (0.1)	1 (0.1)	62 (8.9)
07 / 06 / 2012	57 (8.2)	0 (0.0)	2 (0.3)	59 (8.4)
09 / 06 / 2012	58 (8.3)	3 (0.4)	0 (0.0)	61 (8.7)
Total Off-peak	292 (41.9)	6 (0.9)	4 (0.6)	302 (43.3)
11 / 06 / 2012	63 (9.0)	10 (1.4)	0 (0.0)	73 (10.5)
12 / 06 / 2012	68 (9.8)	0 (0.0)	5 (0.7)	73 (10.5)
13 / 06 / 2012	66 (9.5)	0 (0.0)	0 (0.0)	66 (9.5)
14 / 06 / 2012	80 (11.5)	0 (0.0)	0 (0.0)	80 (11.5)
16 / 06 / 2012	97 (13.9)	0 (0.0)	6 (0.8)	103 (14.8)
Total Peak	374 (53.7)	10 (1.4)	11 (1.6)	395 (56.7)
All combined	666 (95.6)	16 (2.3)	15 (2.1)	697 (100.0)

* Please see note on page 43

Waiting time

Figure 1 shows the scatterplot distribution of Total Waiting Time for the 666 patients available for data analysis. Four hundred and forty-seven patients (67.1%) waited 90 minutes or less, and only two patients had to wait more than 3 hours. The majority of patients had waited between 50 and 100 minutes.

Table 2 presents the average waiting time for the audit period when broken down into its component parts of Peak period, Off-peak period, Registration Time, time between registration and first Called by the DSA, as well as waiting time when 6 or 7 dentists were on duty to attend to the patients. Table 2 also reports data results for when both Peak and Off-peak periods are combined (termed as Overall Average). As

expected, the average waiting time when broken down into component parts of Peak and Off-peak periods show shorter waiting times during Off-peak periods. Average Total Waiting Time during Off-peak period was 74 minutes and this increased to 85 minutes during the Peak period, giving an Overall Average Total Waiting Time of 80 minutes, when data for both periods were combined. However, comparison of waiting time during Peak and Off-peak periods when 6 or 7 dentists were present to attend to patients revealed a longer Total Waiting Time when more dentists were on duty during Off-peak periods. Nevertheless, whether during Peak or Off-peak periods, Registration Time accounted for more than half of the Total Waiting Time.

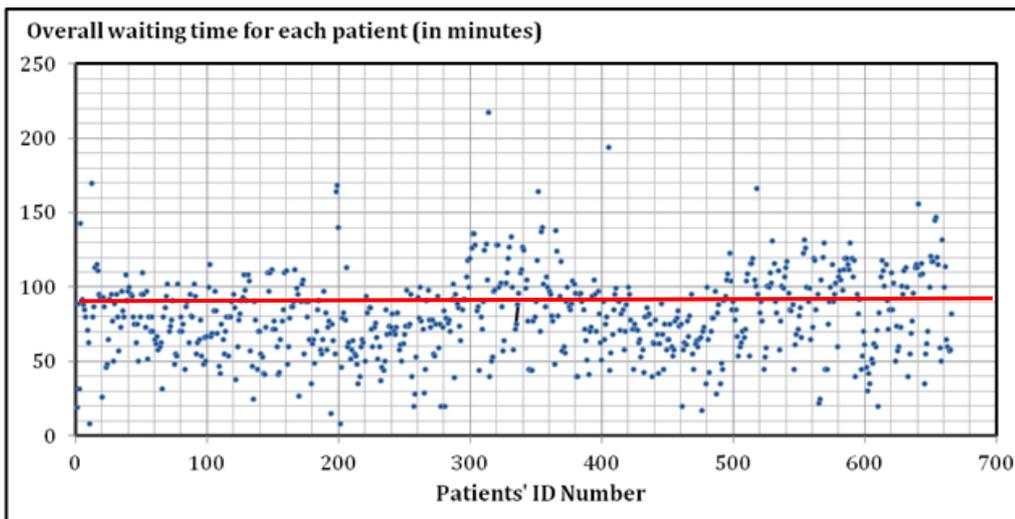


Figure 1. Scatterplot distribution of Total Waiting Time (red line shows standard set for this audit)

Table 2. Average waiting time in minutes (brackets contain range in minutes)

	Average Total Waiting Time	Average Registration Time	Average time between registration and 1 st called by DSA	Average Total Waiting Time (6 dentist)	Average Total Waiting Time (7 dentist)
Peak period	85 (17-217)	46 (5-140)	39 (1-144)	91 (40-217)	82 (17-166)
Off-peak period	74 (8-170)	43 (1-93)	31 (1-129)	69 (8-168)	77 (8-170)
OVERALL Average	80 (8-217)	44 (1-140)	36 (1-144)	80 (8-217)	80 (8-170)

In terms of average time spent with the dentist, during Off-peak periods, this was 21 minutes (range 2-123) and during Peak period, the average was 18 minutes (range 2-93), giving an overall average of 19 minutes.

Types of treatment

Table 3 presents the number of patients for each types of treatment when broken down into its component parts of Off-peak and Peak periods, as well as when 6 or 7 dentists were on duty.

Table 3. Types of treatment

Types of Treatment	Off-peak period (292 patients)		Peak period (374 patients)	
	6 dentists (115 patients)	7 dentists (177 patients)	6 dentists (131 patients)	7 dentists (243 patients)
Check up				
Check up only	13 (11.3)	12 (6.8)	10 (7.6)	23 (9.5)
Check up and radiograph	0 (0.0)	2 (1.1)	0 (0.0)	0 (0.0)
Scaling				
Scaling only	20 (17.4)	27 (15.3)	37 (28.2)	75 (30.9)
Scaling and Radiograph	2 (1.7)	1 (0.6)	1 (0.8)	4 (1.6)
Scaling and filling ¹	4 (3.5)	3 (1.7)	7 (5.3)	3 (1.2)
Scaling and refer ²	0 (0.0)	0 (0.0)	2 (1.5)	1 (0.4)
Scaling and extraction ³	0 (0.0)	1 (0.6)	0 (0.0)	1 (0.4)
Filling				
Filling only	24 (20.9)	43 (24.3)	25 (19.1)	43 (17.7)
Filling and radiograph	0 (0.0)	6 (3.4)	3 (2.3)	14 (5.8)
Filling and scaling ¹	4 (3.5)	3 (1.7)	7 (5.3)	3 (1.2)
Filling and extraction	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.4)
Pulp extirpation				
Pulp extirpation only	1 (0.9)	3 (1.7)	2 (1.5)	3 (1.2)
Pulp extirpation and refer ⁴	1 (0.9)	3 (1.7)	1 (0.8)	0 (0.0)
Extraction				
Extraction only	39 (33.9)	54 (30.5)	35 (26.7)	53 (21.8)
Extraction and scaling ³	0 (0.0)	1 (0.6)	0 (0.0)	1 (0.4)
Extraction and radiograph ⁵	1 (0.9)	7 (4.0)	2 (1.5)	5 (2.1)
Extraction and referral	0 (0.0)	0 (0.0)	1 (0.8)	0 (0.0)
Denture				
Repair denture	3 (2.6)	5 (2.8)	0 (0.0)	0 (0.0)
Referral				
Refer only	3 (2.6)	2 (1.1)	3 (2.3)	5 (2.1)
Refer and scaling ²	0 (0.0)	0 (0.0)	2 (1.5)	1 (0.4)
Refer and pulp extirpation ⁴	1 (0.9)	3 (1.7)	1 (0.8)	0 (0.0)
Refer and extraction ⁵	0 (0.0)	0 (0.0)	1 (0.8)	0 (0.0)
Refer and radiograph	4 (3.5)	8 (4.5)	2 (1.5)	12 (5.0)

Note- the superscript indicates duplicate data

There was a higher percentage of scaling procedure (22.6%) done when there were 6 dentists on duty compared to 7 dentists (18.2%) during Off-peak period. In contrast, there was lower percentage of filling procedure (24.4%) and pulp extirpation (1.8%) done when there were 6 dentists compared to 7 dentists (29.4% and 3.4% respectively) during Off-peak period. The percentage of treatment performed were more or less the same whether 6 or 7 dentists were on duty during Peak period.

When the figures were totaled for each period, this audit found that there was a higher percentage of filling procedure (27.4%) and pulp extirpation (2.7%) performed during Off-peak compared with Peak period (25.7% and 1.6% respectively). In contrast, there were more scaling procedures (35.0%) performed during Peak Period compared to Off-peak period (19.9%).

Analysis of patient satisfaction with their waiting time could not be reported as data was incompletely recorded for this section.

DISCUSSION

This audit set out to determine the waiting time of patients attending the Primary Oral Care Services in the NDC. This is the first recorded audit on waiting time in the NDC so far, which looked into the patients' waiting time during Off-peak and Peak periods in the NDC.

Before discussing the findings, it is appropriate to consider the strengths and weaknesses of the audit. The strength of this audit is the large number of participants involved – 666 participants. Another strength is that the audit was carried out during Off-peak and Peak periods; therefore, comparison is possible between the two.

However, there are potential weaknesses with this audit. First, all forms were filled by the receptionists and the DSAs. While all of the times were noted in the form, the answers to patients' opinion on waiting time may not be valid as this data was often not recorded. This is a potential source of bias; therefore, result on patient opinion is not presented in this audit. Another minor limitation is related to the time noted by the

receptionists and the DSA whereby the clock that they referred to may not be synchronised.

There are three main parts to this discussion, which focuses on the 3 main objectives of this audit. Each will be discussed under appropriate headings.

Average total waiting time during Off-peak and Peak periods

The standard set for this audit was not met as, only 67.1% of patients had waited 90 minutes or less before being seen by the dentist. Nevertheless, the average Total Waiting Time was 74 minutes during Off-peak period compared to an average 85 minutes during Peak period. The reason for the slight increase during Peak period is explained by the increase in the average time required for registration. This slight increase in waiting time during Peak period is predictable as more patients seek treatment during school holidays which implies a longer waiting time for registration when the manpower for reception staff remains constant throughout the two periods.

Average waiting time for registration, and between registration and first called by the DSA

In this audit, Total Waiting Time is defined as the period between Arrival Time and when the patient was first called by the DSA. This means that it included Registration Time as well as the waiting period before being called by the DSA (to be seen by the dentist). When the results are combined for Peak and Off-peak periods, the Overall Average Total Waiting Time for this audit was 80 minutes: 44 minutes for registration, and 36 minutes between registration and First Called by the DSA. Hence, the average time taken for registration contributed more than half to the Total Waiting Time. As explained earlier, the time taken for registration composed of a few processes. The receptionists had to manually look for the patients' case notes before they called the patients to pay the registration fee. Therefore, it is conceivable that patients' waiting time may be reduced by reducing the time taken for registration. It is hoped that with the (smooth) introduction of the computerised systems (BruHIMS), the time taken for registration and hence the patients' waiting time will be improved.

Average total waiting time in relation to the number of dental officers on duty

This audit found that the average Total Waiting Time during Peak period was 82 minutes when there were 7 dental officers in comparison to 91 minutes when there were 6 dental officers. This finding of longer waiting time during Peak periods is similar to those found by Abdullah (2005), where he identified insufficient number of doctors as one of the contributing factors in excessive patient waiting time. Nevertheless, it may not be possible to increase the number of officers at the current NDC location, to more than 7 officers during Peak periods, as the infrastructure limits the number of available dental surgeries.

This audit does not support increasing the number of dentists on duty during Off-peak periods as our waiting time was shorter when there were 6 dentists available as compared to when 7 were on duty. This factor may be contributed by the types of treatment performed. As shown in Table 3, there were less complex types of treatment (such as scaling) performed when there were 6 dentists on duty during Off-peak period. In contrast, more time-consuming treatment was done (such as filling and pulp extirpation) during Off-peak period when there were 7 dentists. Although there is no time specification for each types of treatment done; in general, scaling procedure (gross supragingival scaling) takes less time than filling or pulp extirpation. Extraction procedure can either be quick or takes a long time to perform, depending on the complexity of the treatment (e.g. broken roots). Radiograph taking is not a treatment by itself but, it aids as a diagnostic means for treatment to be performed. Any treatment associated with radiographic taking would increase the time with the dentist, as the patient would have to wait in a different queue at the X-ray Facility Unit.

This audit also found that the average time spent with the dentist was 21 minutes during Off-peak period whereas this reduced to 18 minutes during Peak period. The reason for this was that more complex treatments (filling and pulp extirpation) were performed during Off-peak compared to during peak period. Although the time spent with the dentist is not included in the Total Waiting Time for this audit, this factor can affect the average Total Waiting Time as each subsequent

patient has to wait until the next dentist is available. The longer the dentist spends on each patient, the longer the waiting time will be for the subsequent patients. Anderson *et al.* (2007) reported that the time spent with the doctor is a stronger predictor of patient satisfaction than is the time spent in the waiting room. They suggested that shortening patient waiting times at the expense of time the doctor spends with the patient to improve patient satisfaction scores would be counter-productive. This is in contrast to a study by Camacho *et al.* (2006) who found that increased waiting time is an important source of patient dissatisfaction.

A survey on patient satisfaction conducted by the Quality Improvement Unit, Department of Policy and Planning, Ministry of Health in 2011, recorded average patient satisfaction regarding overall waiting time at the NDC, which included time waiting for registration and before consultation with the dentist. Their findings suggested that the Primary Oral Care Services needed further improvement in terms of waiting time. The other important finding in that survey was that dentists were scored excellent in terms of good manners and explanation of treatment. This is another interesting area in patient satisfaction, which should be included in any future audits. Unfortunately, this audit was unable to analyse patient satisfaction with regards to the waiting time which each patient had experienced due to incomplete recording of data.

CONCLUSION

In conclusion, the standard set has not been met, in that only 67.1% of patients had waited 90 minutes or less before being seen by the dentist. It was also found that time required for registration (including retrieval of dental records) accounted for slightly more than half of the average Total Waiting Time. Generally, the average waiting time also increases as the number of patient increases.

Considering the strengths, limitations, and findings of the present audit, it provides the Department of Dental Services information on the patients' waiting time in the Primary Oral Care Services in the NDC. This audit will also be useful as a kick start to provide "Tekad Pemedulian Orang Ramai", that is, a notice to be shown in the

registration counter as to how long they have to wait before seen by the dentist.

FUTURE RECOMMENDATIONS

As this audit failed to record patient's opinion on their waiting time experience, when a re-audit is repeated after BruHIMS has been fully implemented and is running smoothly, the re-audit should include robust recording on patient satisfaction with waiting time.

REFERENCES

Abdullah M.H. (2005). Study on Outpatients' Waiting Time in Hospital Universiti Kebangsaan Malaysia (HUKM) Through the Six Sigma Approach. Department of Statistic Malaysia.

Buhaug H. (2002). Long waiting lists in hospitals: Operational research needs to be used more often

and may provide answers. *British Medical Journal*, 324(7332): 252–253.

Camacho F., Anderson R., Safrit A., Jones A.S. and Hoffman P. (2006). The Relationship between Patient's Perceived Waiting Time and Office-Based Practice Satisfaction. *North Carolina Medical Journal*, 67(6): 409-413.

The Statistics Department of Anguilla. Analytical Report. Dental Patient Satisfaction Survey Round 2 August to October 2005. Available from http://www.gov.ai/statistics/images/Final_Rep_05.pdf [Accessed on 27th April, 2012]

Anderson R.T., Camacho F.T. and Balkrishnan R. (2007). Willing to wait? The influence of patient wait time on satisfaction with primary care. *BMC Health Services Research*, 7: 31.

An audit of the quality of clinical dental records of Dental Officers in Primary Oral Care Services based in National Dental Centre**

¹Dr. Hj. Majidi Hj. Bakar, ²Dr. Hj. Amirul Rizan bin Hj. Mohamed and ¹Dr. Sylviana Hj. Moris

¹Division of Primary Oral Care Services, ²Division of Research and Development

INTRODUCTION

A dental record is a detailed and continuous documentation of the patient's oral condition, contributing to diagnosis and orderly delivery of treatment to the patient, and it aids in the proper and adequate management of patients (Cole, 2009). Record-keeping in dental practice is a primary responsibility of the dentist, serving the overall goal of protecting both the patient and the dentist (Harris and Pealing, 2001). It is also important for medico-legal reasons. According to the Faculty of General Dental Practitioners (FGDP) in the United Kingdom (UK), a good dental record should be legible, accurate and comprehensive (FGDP, 2000). FGDP also issued a current guidance for general dental practitioners, and this includes guidelines on the contents of clinical dental records.

According to Morgan (2001), evidence from studies carried out in the UK, United States of America, Australia and Scandinavia show that record-keeping often falls well below accepted standards. There have been anecdotal reports of inadequacies in the standard of record-keeping in the National Dental Centre (NDC) including incomplete patient's personal details, non-updated medical history, poor treatment planning and illegibility.

To our knowledge, an audit on the quality of clinical dental records of dental officers in Primary Oral Care based in NDC has not been conducted before. Hence, it is timely that the current practice of clinical dental records among dental officers be assessed. In addition, this audit can suggest any changes which may bring about improvement to the Primary Oral Care Services in particular and the Department of Dental Services as a whole, if this is necessary.

AIM AND OBJECTIVES

To audit the quality of record-keeping in Primary Oral Care Services among dental officers based in NDC.

The objectives of the audit were:

1. To assess the legibility, accurateness and completeness of the clinical dental records.
2. To evaluate the quality of clinical dental record-keeping.
3. To compare the frequency of recording clinical data and total compliance score with other studies

STANDARD

The General Dental Council of the UK in its Standards for dental professionals states that "Make and keep accurate and complete patient records, including a medical history, at the time you treat them" (GDC, 1997). Therefore, it is assumed that every section of the clinical dental record should be completed. Since there is no international standards for the acceptable total compliance score for each dental record, it is then proposed that the minimum total compliance score of 80% is said to be acceptable.

MATERIALS AND METHODS

A retrospective study of 100 clinical dental records of patients seen by dental officers in Primary Oral Care Services based in NDC in the last 5 years was conducted. Each dental record sample from the dental record room was selected by stratified random sampling technique by the main auditor only. Initially, the main auditor divided the entire dental record sample into 100 different subgroups, i.e. named from subgroup 00 to subgroup 99. Then, the main auditor randomly selected one sample from each subgroup. This data collection was conducted for 2 weeks in the month of October 2012. The most recent entry in each dental clinical record was examined.

The recording of the patient’s information by the dental officers was reviewed such as patient’s personal details, the dentist’s documentation practice on patient’s history, extra-oral and intra-oral examination, diagnosis, treatment planning, treatment procedure details and consent.

The data were manually recorded in the data collection sheet* for each patient. The data collection sheet was originally taken from Simpson (2011) and it was then modified by the main auditor with the following options:

- YES – Information present in records
- NO – Information absent from records
- N/A – Not applicable e.g. If no radiographs were taken or no LA given.

To evaluate the quality of record keeping, a total compliance score for each dental record was calculated, as explained in the following section.

Data Analysis

‘Microsoft Excel’ was used to analyse the data collected. The final score of each set of dental records that is the percentage of total compliance score was obtained by dividing the number of ‘YES’ responses by the total of ‘YES’ plus ‘NO’ responses, and then multiplied by 100.

$$\text{Total compliance score for each dental record} = \frac{\text{YES}}{\text{YES} + \text{NO}} \times 100$$

RESULTS

Frequency of recording clinical data

A total of 100 dental records of patients seen by dental officers in NDC were retrieved during the study period. The frequency for each expected record section is shown in Table 1. Figure 1 shows the frequency of recording selected important components of dental records. This audit revealed total absence of recording consent, routine extra-oral examination and intra-oral soft tissues examination. Meanwhile, the patient’s histories for medication, allergies, dental attendance and socio-behaviour were among the second most frequent missing records in the audit. On the other hand, patient’s details (not including the contact numbers) and treatment procedure details were the most frequent clinical data documented by dental officers. However, only half of the samples of dental records had documented an updated medical history. Interestingly, only two-thirds of the dental record samples were completely legible.

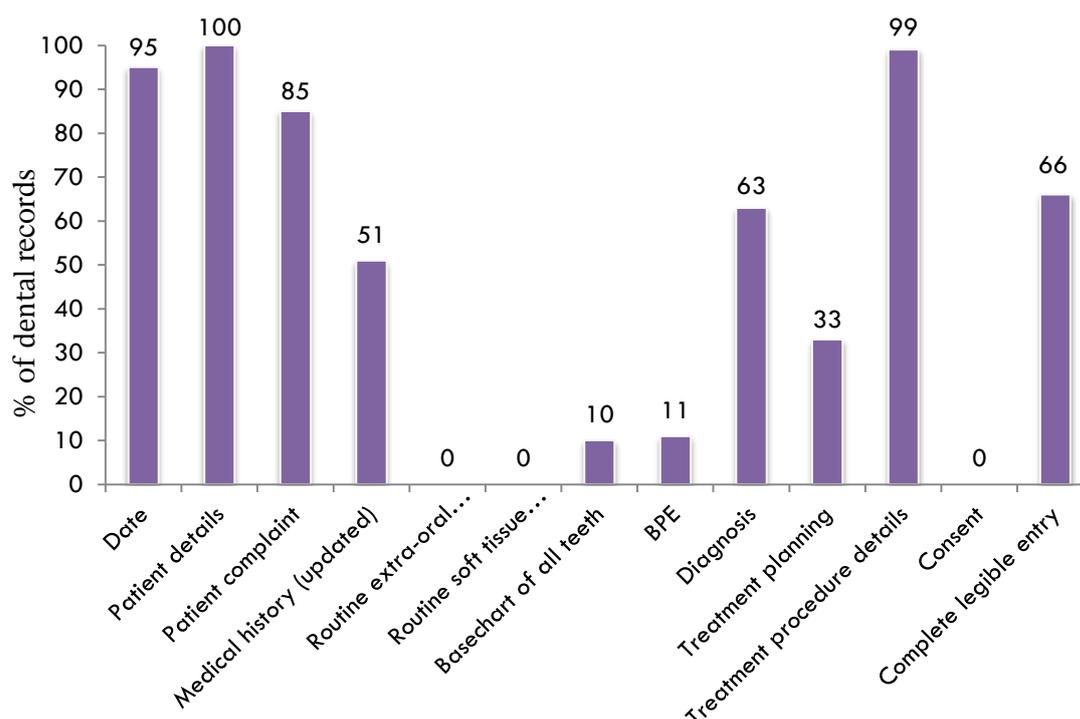


Figure 1. Frequency of recording selected components of dental records

* Please see note on page 43

Table 1. Percentage of dental clinical records with components recorded by dental officers

Patient details	%
Full name	100.0
Date of birth	100.0
Gender	100.0
Address	98.0
Contact number	26.0
Patient's dental record number	99.0
Documentation practice	%
Patient name is on every page (and date of birth and unique identifier)	47.0
The latest entry is dated	95.0
The latest entry is dated with an identifiable signature or initial	95.0
The clinician is identified within the record	44.0
The latest entry is completely legible	66.0
The latest entry is written in permanent photocopyable black/blue ink	100.0
Record free from correction fluid	97.0
Alterations are corrected appropriately (scored out with a single line, dated and signed)	31.0
Abbreviations used are contained in a locally agreed glossary	96.0
Records are written in chronological order	98.0
A letter has been received from the other relevant healthcare professional (if applicable)	50.0
A copy of referral letter to other healthcare professionals is attached (if applicable)	98.0
History	%
History of presenting complaint	85.0
Medical history (updated)	51.0
Medication history (including doses)	6.0
Any allergies	5.0
Dental history (past)	2.0
Socio-behavioural history	1.0
Extra-oral examination	%
Facial symmetry	0.0
Any swelling (including lymph nodes)	0.0
Temporomandibular joint (TMJ)	0.0
Lip seal	0.0
Intra-oral examination	%
Mucosa (buccal, palatal, gingival, alveolar)	3.0
Tongue (dorsal, ventral, lateral surfaces)	0.0
Floor of the mouth	0.0
Complaint tooth	88.0
Base chart of all teeth has been recorded including observations	10.0
Basic Periodontal Examination (BPE) at intervals of not more than 12 months	11.0
Requests for diagnostic tests/investigations including radiographs, with justification	94.0
Results of tests/investigations including radiographs, are recorded	74.0
Prognosis of heavily restored teeth (especially if root-treated) is indicated in the records	63.0
Diagnosis	%
A list of current diagnoses	63.0

Table 1 (cont'd). Percentage of dental clinical records with components recorded by dental officers

Treatment planning	%
An individual plan of care	33.0
Documentation that the patient is involved in the decision making process (if applicable)	0.0
Treatment procedure record	%
Details of procedure performed	99.0
Type of local anaesthetic (LA) used	20.0
LA dose administered	15.0
Site and side of LA given	13.0
Batch number /expiry date of LA recorded	3.0
Materials/ medicaments placed	93.0
Medications prescribed	26.0
Description of difficulties or complications (if applicable)	33.0
Post-operative instructions given	41.0
Consent	%
If written consent is required, it is documented (e.g. for invasive surgical procedure)	0.0
Discussion of benefits and risks/ complications is recorded	0.0

The total compliance score (%) for 100 clinical dental records

The total compliance score (%) for 100 clinical dental records from the audit is shown in Figure 2. The median total compliance score was 45.0%, with a range of 25.0 – 80.0%, and a mean score of 47.0%. Fifty-three dental records (53.0%) had a total compliance score of less than 50.0%, while forty-seven dental records (47.0%) had a score of 50.0% and above. However, only one out of 100 dental records managed to achieve the standard total compliance score, that is, with the score of 80.0% and above.

Comparison of frequency of recording clinical data and total compliance score (%) between this audit and other studies

This audit shows that the most frequently recorded clinical data were patient's details, date and treatment procedures, which are comparable with

other studies done by dental undergraduates in the UK as shown in Table 2 (Pessian and Beckett, 2004). It may appear disappointing that the updating of medical histories is not more comprehensively documented in this audit. However, the figures still compare favourably with an audit study undertaken for the GPs in the UK (Morgan, 2004). Meanwhile, complete legibility is an issue in this audit when compared to an almost perfect score recorded in the UK study.

The mean compliance score in this audit at 47.0%, which is almost comparable with a different study on 208 dental records as documented by dentists in Finland who had reported an average score of 49.2% (Helminen, 2000). However, this audit is in contrast to a study conducted on 100 dental records documented by undergraduate dental students in the UK who had an average score of 73.9% (Figure 3).

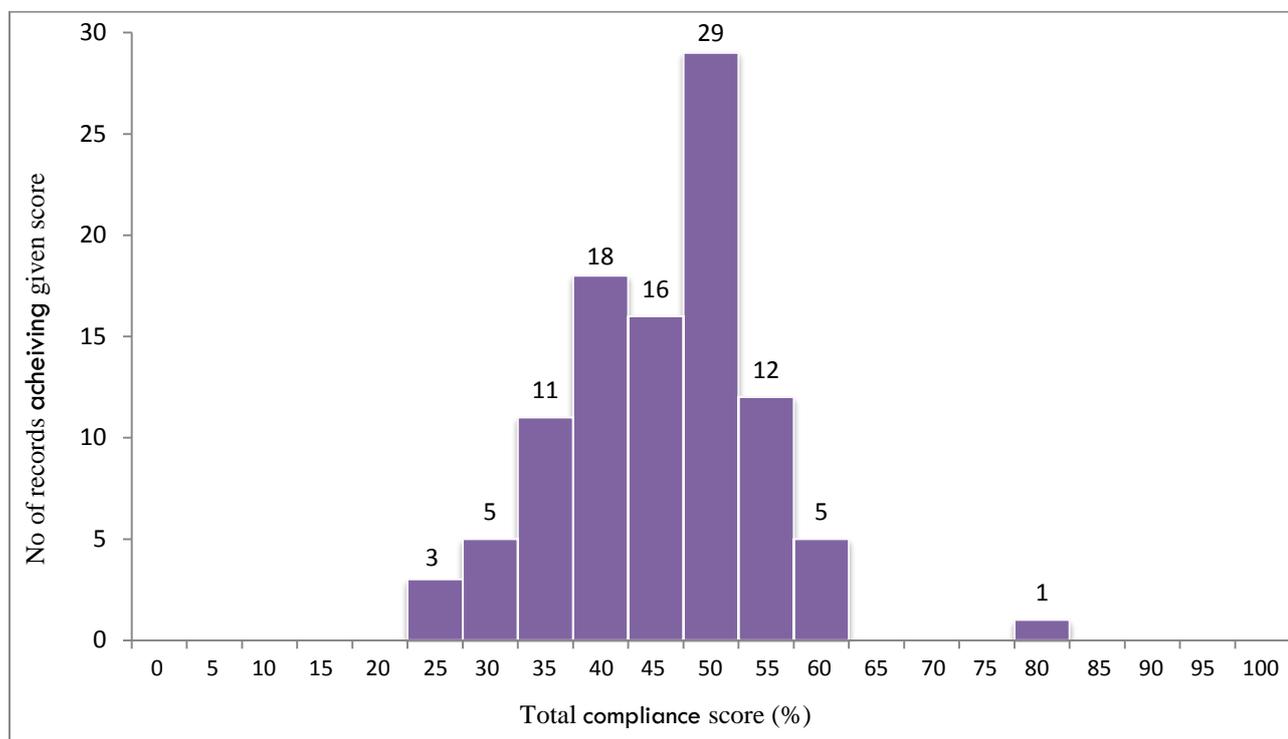


Figure 2. Total compliance score (%) for 100 clinical dental records

Table 2. Frequency of recording selected important components of dental records by NDC dentists, UK GDP and Dental Undergraduates

Selected Important components of dental records	Frequency (%) of recording clinical data by		
	NDC dentist (2012)	GDP in the UK (2001)	Undergraduates in the UK (2004)
Date	95.0	n/a	99.0
Patient details	100.0	n/a	99.0
Patient complaint	85.0	n/a	74.0
Medical history (updated)	51.0	44.6	71.0
Extra-oral examination	0.0	n/a	n/a
Soft tissue examination	0.0	20.0	n/a
Basechart of all teeth	10.0	70.0	n/a
BPE	11.0	20.7	n/a
Diagnosis	63.0	9.7	n/a
Treatment planning	33.0	17.0	99.0
Treatment procedure	99.0	n/a	100
Consent	0.0	n/a	n/a
Complete legible entry	66.0	98.7	n/a

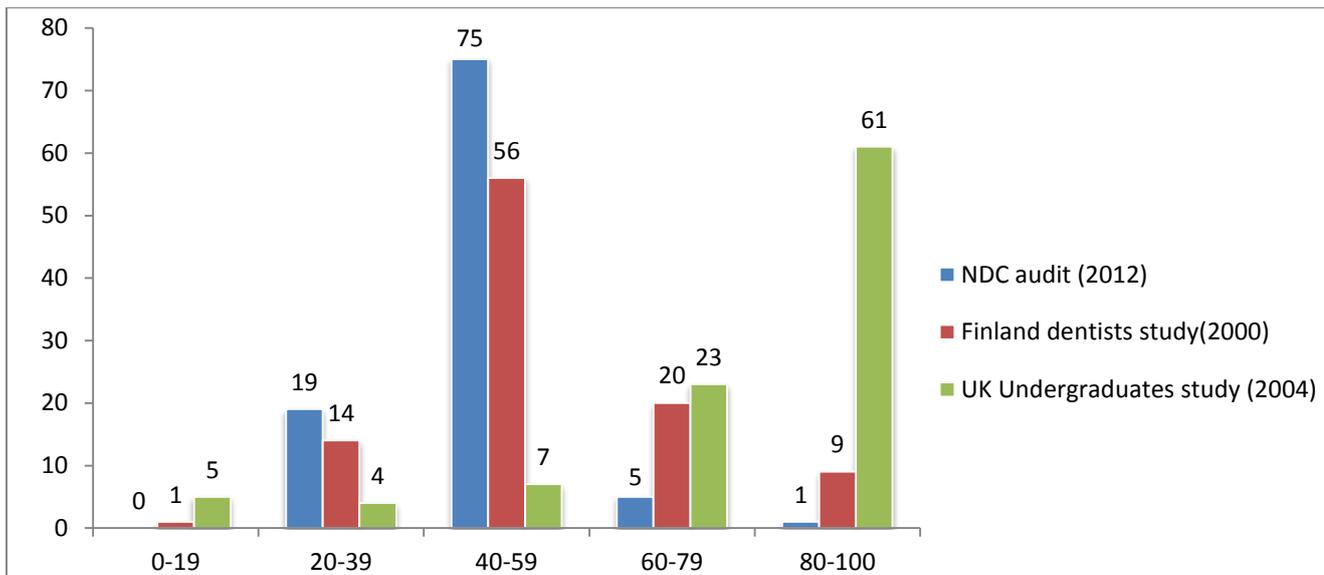


Figure 3. Comparison between the total compliance (%) of the NDC audit with other studies.

DISCUSSION

This audit involved a favourable number of clinical dental records (100) that had been randomly selected using the stratified random sampling technique. Data collection was solely done by the main auditor without the knowledge of other dental officers in the Primary Oral Care Services in NDC. In addition, the data audited did not include records that had been documented by the main auditor and co-auditors, hence minimising bias.

Although all dental record samples were randomly selected, it is possible some of the data collected may have been from the same dental officer, and may also have not included some dental officers who had worked in the Primary Oral Care Services in NDC in the past five years.

There was inaccuracy and incompleteness in documenting every section of the clinical dental records. The most frequently unrecorded items as discovered by the audit were valid consent, routine extra-oral and intra-oral soft tissue examinations. This may be due to the fact that most of the consents taken are either verbal or implied consent as these consents were regarded as norms. A patient may imply consent by his actions. For instance, a patient comes with a toothache, is examined, and is informed radiographs are required. The patient allows the radiographs to be taken without any objections. In this case, consent is implied by the actions or non-actions of the patient. The key elements are that the patient was aware

of the problem and made no objection when the treatment began.

90.0% of dental record samples did not contain the Basic Periodontal Examination (BPE) score as due to high patient workloads, dental officers usually do not have much time to record. Lack of BPE recording makes it difficult to determine the periodontal health of these patients, and this finding is almost comparable with the study done among the GDPs in the UK. Nevertheless, in defining quality dental care, the recording of all the important clinical components of record-keeping must be adequate and accurate to conclude the oral health of a patient retrospectively with reasonable certainty (Morgan, 2001).

Medical histories were commonly documented by the dental officers during the first treatment visits only but were not documented during the recall visits. Medical history including medication changes must be updated and recorded (signed and dated) at every visit. Not only because it is an essential tool in providing quality dental care, but it that also protects both the patient and the dental officers from unnecessary risks.

Although the recording of the lists of current diagnoses appears to be relatively higher than the results in the UK study, most dental officers still did not record the diagnosis completely and accurately. In most cases, the diagnosis did not

include the extent, location, and other characteristics of the disease.

Despite the fact that treatment planning seems to be the most important decision, particularly for the patients, treatment planning was poorly recorded in this audit. One possible reason for poor treatment planning among dental officers in NDC may be due to the low emphasis placed on the importance of treatment planning coupled with the issue of time-constraints.

The handwriting of dental officers was found to be not completely legible for one-third of the dental records audited. This is supported by studies that found the handwriting of doctors including dentists to be significantly less legible than their fellow health-care professionals, and that the handwriting were often completely illegible (Rodriguez-Vera, 2002). It is part of the legal duty to the patient to sustain a neat and legible dental record in order to deliver continuity of dental care (GDC, 1997).

The total compliance score in this audit is well below the standard that had been set, but is almost comparable with a different study done in Finland (Helminen, 2000). This may be related to the time constraint factor, which was a common problem faced by many dentists working in the public sectors, not just in Finland (Helminen, 2000) but also in many countries (Morgan, 2001). In contrast, dental undergraduates in the UK, as students in more ideal settings, had ample time to see each patient on a treatment visit, with time to document dental records more ideally. Moreover, the presence of a supervisor who had co-signed the documentation, for the UK undergraduates, may explain the increased average score in that study setting.

CONCLUSION

The quality of dental record-keeping among dental officers in Primary Oral Care Services based in NDC is poor. Important dental record sections that could impact on basic dental care provision and continuity of care were missing from many dental records. Hence, it is necessary to remind and educate officers on the importance of proper documentation of records. There is a need to re-evaluate and re-audit the quality of dental record-keeping among dental officers based in

NDC after a suitable period (possibly 6 months to one year) to review change in practice.

RECOMMENDATIONS

With the findings of this audit, recommendations are as follows:

- 1) This audit on the quality of dental record-keeping and its results will be disseminated widely not just to all dental officers in the Primary Oral Care Services but also to any dental officers including dental therapists and hygienists throughout the country to highlight the problems identified with record-keeping.
- 2) A lecture covering the good standards of record-keeping will be given to all the dental officers in Primary Oral Care Services.
- 3) A standard guideline document on patient examination and record-keeping in dental practice is recommended.
- 4) Re-audit will be repeated after a suitable period (possibly one year) in order to review change in practice.

REFERENCES

Cole A. and McMichael A. (2009). Audit of dental practice record-keeping: a PCT-coordinated clinical audit by Worcestershire dentists. *Primary Dental Care*, 16(3): 85 – 93.

Faculty of General Dental Practitioners (UK) (2000). *Current guidelines for general dental practice*. London: FGDP.

General Dental Council (1997). *Maintaining Standards. Guidance to the Dental Team on Professional and Personal Conduct*. London: GDC.

Helminen S.E. (2000). *Quality of Care Provided for Young Adults and Adolescent in the Finnish Public Oral Health Service, Helsinki*. Available from <https://helda.helsinki.fi/bitstream/handle/10138/20299/quality.pdf?sequence=1> [Accessed on 20th November, 2012].

Ireland R.S., Harris R.V. and Pealing R. (2001). Clinical record-keeping by general dental practitioners piloting the Denplan 'excel'

accreditation programme. *British Dental Journal*, 191 (5): 260 – 263.

Morgan R.G. (2001). Quality evaluation of clinical records of a group of general dental practitioners entering a quality assurance programme. *British Dental Journal*, 191(8): 436 – 441.

Pessian F. and Beckett H.A. (2004). Record keeping by undergraduate dental students: a clinical audit. *British Dental Journal*, 197(11): 703 – 705.

Rodriguez-Vera F., Marin Y., Sanchez A., Borrachero C. and Pujol E. (2002). Illegible handwriting in medical records. *Journal of the Royal Society Medicine*, 95:545–6.

Simpson T. (2011). *Record keeping for dental practitioners: a comprehensive audit*. Summons. Available from http://www.sdmag.co.uk/index.php/article/pm_article/patient_notes/ [Accessed on 20th November, 2012].

Audit on the completeness of dental radiograph requests made using dental radiographic request folders as received at the National Dental Centre Block B X-ray facility

Dr. Ting Shin Yeu, Dr. Jacqueline Kamaluddin, Hj. Juhaini Hj. Abd. Kadir and
Hj. Abd. Jaafar Hj. Hassan
Dental Radiation Protection Unit

INTRODUCTION

The Guidance Notes for Dental Practitioners on the Safe Use of X-ray Equipment 2001 by the National Radiological Protection Board, UK, recognises that it is necessary to consider the potential harm from radiation exposure (albeit relatively small), and to take measures to avoid exposures which have no merit. It describes a number of measures including appropriate training for radiographers in ensuring good quality radiographs, as well as justifying the need for radiographs. Only the latter will be investigated in this audit.

According to the International Commission of Radiation Protection (1990), it is the responsibility of the requesting practitioner to justify individual procedures. For an exposure to be justified, the benefits have to outweigh the risks for the diagnostic radiation procedure. In addition, the exposure should be expected to provide new information towards the patient's management or prognosis. A list of possible justifications for radiographs is available*.

Within Ministry of Health (Brunei Darussalam) Department of Dental Services, all requests and justification for dental radiograph requests are supposed to be noted on the dental radiographic request folder. These folders replace the previously supplied white radiographic request slips which are being phased out as there is no allocated space to record necessary justification for radiographs thus requested. At the time of this audit being carried out, however, these request slips were still accepted by the X-ray unit and reminders were attached to the dispatched completed films, requesting the clinicians to use the recommended dental radiographic request folders in the future.

The X-ray facilities at the Department of Dental Services, Ministry of Health follow guidelines on the use of Ionising Radiation issued by the RIPAS

Hospital Radiology Department (Guidelines on Radiation Protection in Dental Radiography, 2012). No data currently exists on the completeness of dental radiograph requests received at the National Dental Centre (NDC) Block B X-ray facility.

AIM AND OBJECTIVES

To audit the completeness of dental radiograph requests made using dental radiographic request folders as received at the National Dental Centre, Block B, X-ray facility.

The objectives of the audit were:

1. To assess whether dental radiograph requests are routinely using the prepared dental radiographic request folders.
2. To determine whether requests made on the dental radiographic request folders are filled out appropriately.
3. To assess if justifications for requested radiographs are recorded by the clinicians on the dental radiographic request folders.

STANDARDS

1. 99% of all radiographic requests should be made using the dental radiographic request folders
2. 100% of all radiographic requests made on dental radiographic request folders should be filled out appropriately
3. 100% of all dental radiograph requests should be justified on the dental radiographic request folders

MATERIALS AND METHODS

- This was a prospective audit of dental radiograph requests received at the NDC Block B, X-ray facility during 8 working days from 3rd September to 12th September 2013.
- This X-ray facility was chosen as it is the main facility in the Department of Dental

* Please see note on page 43

Services, receiving the largest number of dental radiograph requests from within NDC, peripheral dental clinics in Brunei-Muara District as well as from the private clinics. On an annual basis, this facility takes approximately 16,000 radiographs of the teeth and jaws, comprising bitewings, periapicals, occlusal and panoramic films (Productivity Returns for the Block B Dental Radiology Facility, National Dental Centre 2012).

- For the purposes of this audit, an initial draft data collection form was piloted in August 2013 for a period of 3 days and amendments were subsequently made, which resulted in Data Collection Forms 1* and 2*. These were then used by the two co-auditors, Hj. Juhaini Hj. Abd. Kadir and Hj. Abd. Jaafar Hj. Hassan, who were the assigned x-ray technicians at the NDC X-ray facility, to collect data for this audit.
- **Data Collection Form 1** was used to collect data for the assessment of completeness of radiograph requests where:
 - Data was collected from the first 20 consecutive dental radiographic request folders (request folders) received each morning of the audit period until the set target of 160 (20 x 8 days) in total, was met.
 - To determine if the dental radiographic request folders were filled out appropriately, all details must be completely filled for the following three sections:
 - **Patient details** which should include patient's name, identity card number and date of birth.
 - **Requesting clinician's details** which should include date of request, clinic/hospital and signature of clinician.
 - **Radiographic details** which should state justification for the requested views.
 - Collection of data involved recording of a positive response (+) in the appropriate column, with the exception of the last column where the exact justification written by the requesting clinician was recorded.
- Where a positive response was absent, a dash (-) was written to indicate that the request folder was incompletely filled and thus did not meet the criteria for that of a completed request.
- Only request folders which had stated type and view of radiographs requested were processed by the x-ray technicians. As a result, only one column exists under the 'radiographic details' section, that is, to record the absence or presence of justification for requesting the radiograph(s).
- As the white radiographic request slips (white slips) lack space for notation of justification for a radiograph request, requests made on these slips were excluded from entry into Data Collection Form 1. Also excluded were requests from the private sector.
- **Data Collection Form 2** was used to collect data for assessment of dental radiograph requests according to type of forms used i.e. request folders, white slips or the category 'others' which covered for requests from the private clinics.
 - Data on type of form used was collected for the first 20 consecutive requests for radiographs received each morning of the audit period (up to the set target of 160 requests) irrespective of whether the requests had been made on request folders, white slips or any other forms. As each request was received, a vertical bar was recorded in the appropriate column to indicate each type of form used and this was tallied up to give the total number for each type of request.
- The method of sample section was chosen to reduce data collection bias and also to minimise the workload for the co-auditors

who were the ones who had to comply with and process all radiograph requests

- Data was analysed using Microsoft Excel™ 2010

RESULTS

- The **standards set** for all the three objectives **were not met.**

Types of form used

Figure 1 shows the distribution of requests according to types of forms used.

Appropriately filled dental radiographic request folders

- Out of the 160 request folders audited, 100% had completed Patient Details.
- 159 folders (99%) had completed Requesting Clinicians' Details with only one

request folder missing both the clinic/hospital and signature of the requesting clinician. This same folder also did not contain a justification for the requested radiograph.

- Only 29 request folders (18%) had completed Radiographic Details i.e. contained justification for the radiographs requested. Justifications had included clinical conditions to be assessed (e.g. caries, bone levels), specific areas of interest (e.g. apices, wisdom teeth), current treatment (e.g. root canal treatment) and for referral to specialists.
- As a result, **only 29 dental radiographic request folders (18%) were judged as having been completely filled** in all 3 sections i.e. for patient, requesting clinician and radiographic details.
- Table 1 shows the results according to completeness of details filled.

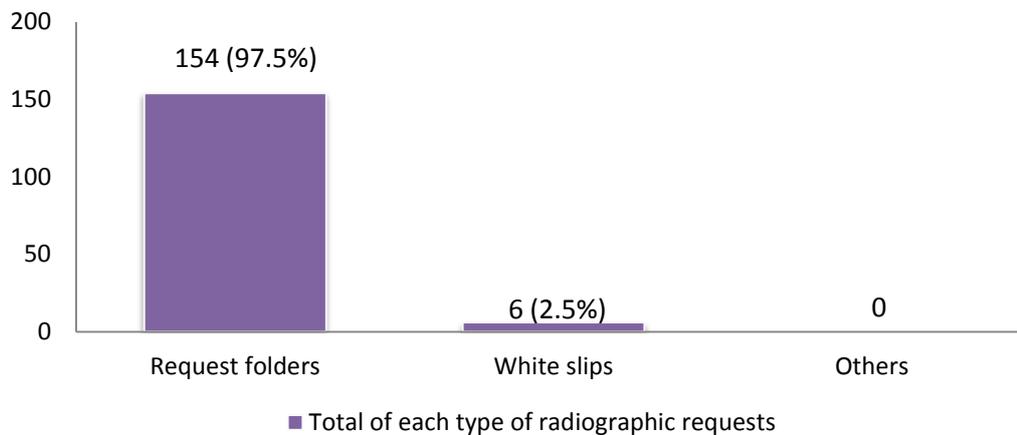


Figure 1: Distribution of dental radiograph requests according to types of forms used

Table 1: Frequency distribution of dental radiographic request folders with completed details according to patient, requesting clinician and justification details

	Patient Details			Requesting clinician Details			Radiographic Details
	Name	IC no.	D.O.B.	Date	Clinic/Hospital	Signature	Justification
Frequency (%)	160 (100%)	160 (100%)	160 (100%)	160 (100%)	159 (99%)	159 (99%)	29 (18%)
Overall (%)	160 (100%)			159 (99%)			29 (18%)

DISCUSSION

Type of forms used

- The first objective on use of the recommended dental radiographic request folders had been set at a standard of 99% to allow for some requests in the form of white radiographic request slips (in the process of being phased out), as well as to allow for requests in other manners from the private clinics who do not have access to the request folders.
- The standard set was not met, as, although the majority (97.5%) of radiograph requests were in the form of the request folders, 2.5 % were in the form of white slips. There were no requests received in any other types of forms. Nevertheless, the audit demonstrated that a small number of white slips were still being used.

Appropriately filled dental radiographic request folders

- Although all of patients' details were completely filled, only 99% of the request folders had been filled appropriately with respect to the requesting clinician's details and 1% of the folders lacked details of the requesting clinician's clinic/hospital and signature.
- Thus the standard set for the second objective was not met.
- The validity of a radiograph request becomes questionable with the lack of the referring clinician's signature as it results in the clinician's lack of accountability in exposing the patient to ionising radiation. Furthermore, incomplete clinician's details may result in difficulty in contacting the clinician should any queries arise or in the case where additional information is required.

Justification for requesting radiographs

- For the third objective, only data from the request folders was included as only these request folders have an allocated space for recording of justification for requesting the radiographs. The white slips were excluded for this assessment due to the lack of space for recording justification and thus, cannot be expected to contain any justification.

- Only 18% of the audited request folders had justifications recorded by the clinicians. Although the results on clinicians recording their justification for requesting radiographs is demonstrably poor, the real situation could actually be worse, as there is the possibility of recording bias from the auditors and members of the Clinical Audit Division (who were aware of the audit before it was started).
- It should be noted that the space allocated to fill in the justification (labelled as 'Clinical Condition' on the request folder) is shared with 'view of radiograph' requested. Hence, it may be possible that clinicians have missed the requirement to write their justification, or, it may be that the clinicians are unaware that details of the justification should be recorded. Thus a new radiographic request folder which clearly indicates the need for recording justification should be designed.
- As discussed in the introduction, as part of good clinical practice, all clinicians requesting radiographs need to demonstrate that when they request radiographs, they have weighed the risks of ionizing radiation exposure to the patient, against the perceived benefits of the information the radiograph is expected to give. Meeting this requirement involves a simple noting down of the justification with the type and view of radiograph requested. In addition, by noting the justification for requiring the radiograph, this can give additional information to the x-ray technicians so that they can more efficiently meet the clinical needs of the request.

CONCLUSION

- None of the three objectives met the set standards.
- A small number of requests in the form of white radiographic request slips were being used.
- All patient details were consistently completed but this was not so for the requesting clinician's details. All details on the dental radiographic request folders need to be consistently completed.

- The majority of the request folders did not have any justification written down by the requesting clinician.

RECOMMENDATIONS

- Reminders will be attached to all incomplete dental radiographic request folders indicating the information missing, which is required for future requests.
- Advice on responsible prescription of radiographs including the following recommendations will be presented as part of the CME lectures organised by the Department of Dental Services:
 - White radiographic request slips are in the final stages of being phased out and will no longer be accepted after a period of 3 months following dissemination of the recommendations. The dental radiographic request folders should be used instead. A new improved version of the request folders will be designed which will include separate allocated sections for the views requested as well as the justification/ clinical condition. However, due to a large number of current folders in our existing stock, these current folders will continue to be used.
 - All radiographic request folders should be completely filled.
 - It is necessary to record justification for the requested radiograph on the folder. This is in line with guidance from the International Commission of Radiation Protection 1990, for clinicians to demonstrate their responsibility to justify all radiographic procedures.
- Written information will be issued and distributed to all dental clinics within the Ministry of Health to reinforce the above recommendations, as well as to remind all

dental officers in charge to ensure adequate stock of dental radiographic request folders in each clinic. The supply of request folders should be regularly monitored to ensure that there is no shortage. All dental clinics requiring additional supplies of the folders are advised to directly contact the focal person at the X-ray facility at NDC.

- The above initiatives aim to ensure that all dental officers are notified of these recommendations as many dentists may not be aware of the responsible requirement to record justification on the request folders.
- The next audit on this topic will be after a period of one year following dissemination of this information following conclusion of the phase-out period of the white slips. Furthermore, only radiograph requests from within the Ministry of Health will be included in the re-audit, thus, excluding requests from private clinics.

REFERENCES

United Kingdom. National Radiological Protection Board (2001). *Guidance Notes for Dental Practitioners on the Safe Use of X-ray Equipment*. Chilton, Oxford: NRPB.

International Commission on Radiological Protection (2007). *The 2007 Recommendations of the International Commission on Radiological Protection*. ICRP Publication 103. Ann 37 (2-4).

Brunei Darussalam. Ministry of Health (2012). *Guidelines on Radiation Protection in Dental Radiography 2012*. Brunei Darussalam: MOH.

Abd Kadir, J. (2012). *Productivity Returns for the Block B Dental Radiology Facility, National Dental Centre*. Unpublished report, Department of Dental Services, Brunei Darussalam.

An audit on knowledge concerning the management of avulsed permanent teeth amongst Primary Oral Care Dentists working under Ministry of Health, Brunei Darussalam

¹Dr. Hj. Hamizah Hj. Hamdani, ²Dr. Kok Ei Chuen and ³Dr. Hj. Amirul Rizan Hj. Mohamed
¹Division of Primary Oral Care Services, ²Paediatric Dental Unit, ³Division of Research and Development

INTRODUCTION

Tooth avulsion (exarticulation, total luxation) implies total displacement of the tooth out of its socket. Avulsion of permanent teeth is seen in 0.5-3.0% of all dental injuries and the maxillary central incisors are the most commonly affected teeth (Andreasen and Andreasen, 2007). Numerous studies showed that avulsion of permanent teeth is one of the most serious dental injuries and the prognosis depends on correct measures being taken immediately after the injury (Andersson *et al.*, 2012). Losing permanent anterior tooth/teeth may have physical and psychological impact on the patient (Hu *et al.*, 2006). Immediate and correct management taken gives a better prognosis and prevents further complications that could result in high costs of treatment for replacement at a later date (Abu-Dawoud *et al.*, 2007).

The need for follow-up after replantation of an avulsed permanent tooth is also important. The replanted tooth should be monitored clinically and radiographically after 4 weeks, 3 months, 6 months, 1 year and yearly thereafter (Andersson *et al.*, 2012). It should be reviewed annually for at least 5 years (Trope, 2011). Undergraduate dental training is expected to have equipped dental students with knowledge on management of dental trauma including avulsion. However, the reality of qualified dentists having experience managing it would be not as common. A review of the Accident and Emergency (A&E) logbook at RIPAS Hospital showed that there had been 12 cases of avulsion of permanent teeth reported in the past 2 years. There may be more cases which turn up at dental clinics during normal working hours.

This audit has never been done before and will provide baseline information on (Brunei Darussalam, Ministry of Health) primary oral care

dentist's knowledge about managing avulsion of permanent teeth.

AIM AND OBJECTIVES

The aim of this audit was to assess the knowledge level on the management of permanent teeth avulsion among primary oral care dentists working in the Ministry of Health, Brunei Darussalam.

The objectives of this audit were to assess (a) their knowledge in the emergency management of avulsed permanent teeth, (b) their confidence levels in managing avulsion of permanent teeth, (c) their knowledge on follow-up management of permanent tooth avulsion and (d) any barriers they may face or limitations they may experience with regards to management of dental avulsion.

MATERIALS AND METHODS

This audit used a 40-items questionnaire, adapted from several articles which were reported from Zhao and Gong (2010), Krastl *et al.* (2009), and Yeng and Parashos (2008).

The questionnaire* consisted of four sections: section A on demographic information, section B on the emergency management of permanent teeth avulsion in A&E, section C on the knowledge of management of avulsed permanent teeth, and section D on follow up and review. It comprised a series of statements using a four-point Likert scale graded from 'strongly agree', 'agree', 'disagree' to 'strongly disagree'. There were two open-ended questions regarding perceived barriers and suggestions for improvement of dental trauma emergency management at A&E.

The questionnaires were distributed to all 42 primary oral care dentists working in the Ministry of Health, Brunei Darussalam. The questionnaires were distributed from 19th February 2014 to the

* Please see note on page 43

6th March 2014. To verify the wording of the questionnaire, a pilot study was conducted on 5 primary oral care dentists (10% of total participants) working in National Dental Centre (NDC) two days prior to actual survey and editing to the questionnaire was done as necessary.

The questionnaires were distributed to the primary oral care dentists at the peripheral clinics in Brunei-Muara district by the main auditor and were collected on the same day. Those who worked at the NDC would leave their questionnaires in an envelope placed at the Research and Development Division. The questionnaire was emailed to the dental officer who worked in Temburong. The dental officer then printed the questionnaire and handed it in to the Research and Development Division. For those who worked in Tutong and Belait districts, the questionnaires were placed in an envelope and were given to the visiting dentists that went there. The visiting dentists collected them on a different day.

Inclusion and exclusion criteria

Inclusion: All Ministry of Health primary oral care dentists including dentist posted at Police Headquarters and dentists who are currently undergoing the “Basic Specialty Training”.

Exclusion: Dentists who are not doing primary oral care; specialist dentists; dentists who are undergoing in-service training overseas, on leave without pay and those who had not reported back for work with the Ministry of Health as of 30th January 2014; dentists who were on leave during the audit period; dentists who submitted the questionnaire after audit period; auditor and co-auditor.

Data was entered into a Microsoft Excel Spreadsheet and then analysed. Strongly agree and agree was categorised as a ‘yes’ response whereas strongly disagree and disagree as a ‘no’ response.

STANDARD

All primary oral care dentists should score 100% for Section C of the questionnaire with regards to knowledge of (emergency) management of avulsion as these trauma management guidelines are available online from International Association of Dental Traumatology (Andersson *et al.*, 2012).

RESULTS

Demographic data

The response rate was 90% (40 questionnaires returned but only 38 were completely filled in and evaluated). About three-quarters of the participants were in 21 to 40 years old age group, and more than half of the participants had graduated within the last 10 years (Table 1). Only 24 (63.2%) of the participants were aware of the IADT (International Association of Dental Traumatology Guidelines). More than two-thirds of the participants admitted to having sufficient knowledge regarding dental trauma and have sought continuing education on its management after graduation. Only 15 (39.5%) participants reported of coming across permanent tooth avulsion cases in the past 2 years.

Knowledge on emergency treatment of permanent avulsed tooth

The set standard was not met. Only 1 participant scored 100% correct answers on Section C with regards to the knowledge of emergency avulsion management based on IADT guidelines. About 63.0% of the participants scored more than 80.0% correct answers on Section C overall. The participants who are aware of IADT guidelines scored no less than 60.0% of the questions correctly as compared to those who are not aware of the guidelines. Twenty-nine participants (76.3%) showed poor knowledge with regards to period for splinting of a replanted avulsed permanent tooth (Table 2).

Confidence levels in managing avulsion of permanent teeth

Overall, 31 (81.6%) participants were confident to manage the patient at A&E, and only 3 (7.9%) participants would prefer the patient to be treated the next working day (Table 3). However, 4 (10.5%) participants indicated they were not confident in managing avulsion of permanent teeth whether at A&E or in their dental clinic.

Knowledge on follow-up management of permanent tooth avulsion

If an adult patient with an avulsion were referred to the participants, 32 (84.2%) participants would start endodontic treatment and continue treatment until completion themselves. Ten (26.3%) participants would refer the patient to an endodontist (Table 4).

Table 1. Demographic data

Demographic information	Number (%)
Gender	
Male	16 (42.1)
Female	22 (57.9)
Age	
21-30	15 (39.5)
31-40	13 (34.2)
41-50	5 (13.2)
51-60	3 (7.9)
≥60	2 (5.3)
Years since graduation	
1-10	22 (57.9)
11-20	10 (26.3)
21-30	2 (5.3)
31-40	4 (10.5)
On-call duty	
1 st oncall	28 (73.7)
2 nd oncall	10 (26.3)
On-call districts	
Brunei-Muara	30 (78.9)
Tutong	4 (10.5)
Belait	4 (10.5)
Temburong	0 (0.0)
Sought any continuing education after graduation?	
Yes	29 (76.3)
No	9 (23.7)
Self-reflect on knowledge in dental trauma	
Fragmentary	2 (5.3)
Sufficient	30 (78.9)
Comprehensive	6 (15.8)
Have you come across permanent tooth avulsion cases in the past 2 years?	
Yes	15 (39.5)
No	23 (60.5)
Are you aware of the IADT guidelines?	
Yes	24 (63.2)
No	14 (36.8)
All combined	38 (100.0)

Table 2. Number of correct responses on knowledge on emergency treatment of permanent avulsed tooth

Statement	Correct answers	Number (%)
Critical time for treatment is less than 60 minutes	Yes	38 (100.0)
Replantation should be carried out at site of injury	Yes	31 (81.6)
Replantation should only be carried out at dental clinic or A&E	No	26 (68.4)
Choice of treatment does not depend on maturity of root (open or closed apex)	No	31 (81.6)
Goal for replanting immature teeth is to allow for possible revascularization of pulp space	Yes	37 (97.4)
Periodontal ligament cells are not viable if the total extra-oral dry time > 60 minutes regardless of storage in physiologic medium	Yes	31 (81.6)
Periodontal ligament necrosis of the implanted avulsed tooth can lead to replacement resorption	Yes	36 (94.7)
Replacement resorption would cause tooth mobility	No	21 (55.3)
Root canal treatment for closed apex should always commence before replantation	No	25 (65.8)
Splinting for 4 weeks after replantation	No	9 (23.7)
Physiologic storage medium:		
Milk	Yes	37 (97.4)
Child mouth/ saliva	Yes	31 (81.6)
Saline	Yes	30 (78.9)
Glad wrap (polyethylene film)	No	38 (100.0)
Hanks Balanced salt solution	Yes	21 (55.3)
Tap water	No	38 (100.0)
Tissue paper	No	38 (100.0)

Table 3. Responses with respect to the scenario given "You are on-call and presented at A&E with an avulsion of a permanent incisor. There are no other injuries sustained.

Statement	Number (%)
Over the phone, advise referring A&E doctor to put avulsed tooth in physiologic medium	36 (94.7)
Confident to manage patient at A&E	31 (81.6)
Not confident to manage at A&E and prefer treat patient in clinic the next working day	3 (7.9)
Replant avulsed permanent teeth in all cases	16 (42.1)
Splinting done at A&E	32 (84.2)
Easy to find materials and instruments at A&E	8 (21.1)
Get help from A&E staff	30 (78.9)
Splinting techniques used:	
Composite and wire	16 (42.1)
GIC and wire	10 (26.3)
GIC only	5 (13.2)
Suture	4 (10.5)
Others	0 (0.0)
Refer to:	
Yourself	10 (26.3)
Oral surgeon	3 (7.9)
Dental officer at peripheral clinic	27 (71.1)
Others: Endodontist	1 (2.6)

Table 4. Responses with respect to the scenario given, “You are referred an adult patient with avulsion in your normal clinic (tooth has been re-implanted and splinted back in place).”

Statement	Number (%)
Take periapical radiograph at first visit	37 (97.4)
Start endodontic treatment 7-10 days later myself and continue with treatment until completion	32 (84.2)
Refer to endodontist for treatment	10 (26.3)
Review patient after endodontic treatment completed	38 (100.0)
Period of review:	
No need for review	0 (0.0)
3 months	8 (21.1)
6 months	8 (21.1)
1 year	13 (34.2)
Annually for 5 years	9 (23.7)
Annually for 10 years	0 (0.0)

Barriers or limitations with regards to management of dental avulsion

Out of the participants who were first on-call, 78.6% would get help from A&E staff, and only

28.6% would call the 2nd on-call for help. Overall, 21 (55.3%) participants identified lack of instruments, materials and equipment as barriers in managing an avulsed tooth at A&E (Table 5).

Table 5. Barriers faced in managing patients at A&E

Barriers	1 st on-call (%)	2 nd on-call (%)
Lack of instruments, materials and equipment	18 (64.3)	3 (30.0)
Lack of assistance or staff support	14 (50.0)	3 (30.0)
Undesirable clinical settings- no suction, poor lighting, no dental chair	11 (39.3)	3 (30.0)
Unfamiliar with A&E setting	5 (17.9)	1 (10.0)
All combined	28 (100.0)	10 (100.0)

DISCUSSION

The aim of this audit was to assess the level of (Brunei Darussalam, Ministry of Health) primary oral care dentists' knowledge on how to manage avulsion of permanent teeth. The standard was set at “all dentists should score 100% for Section C of the questionnaire with regards to the emergency management of avulsion because guidelines are available online from International Association of Dental Traumatology”. However, only one dentist

was able to meet that standard and about two-thirds of the participants scored more than 80% correct answers on Section C overall.

This audit is based on the IADT guidelines. However, as stated by Andersson *et al.*, (2012) “it is understood that guidelines should be applied with judgement of the specific clinical circumstances, clinicians' judgements, and patients' characteristics including but not limited to

compliance, finances and understanding of the immediate and long-term outcomes of treatment alternatives versus non-treatment". In other words, there are no rigid correct or incorrect answers to the management of dental trauma. It depends on a case-by-case basis as well as the practitioners' experience of what works for them.

Before discussing its findings, it is appropriate to consider the strengths and weaknesses of this audit. The strength of this audit is that the response rate was high and there was a pilot study conducted to eliminate vague and confusing questions. However, the weakness of this audit is that the participants were not supervised when answering the questionnaire and this might lead to bias. In addition, for those working outside Brunei-Muara district, they had the advantage of more than one day to answer the questionnaire that might compromise their responses.

The findings of the audit will be discussed according to the 4 main objectives of the audit.

Knowledge on emergency treatment of permanent avulsed tooth

The International Association of Dental Traumatology (IADT) in 2007 published guidelines online on the management of traumatized teeth. The latest revision was in 2012. It was found that out of the 24 participants who were aware of the IADT guidelines, 19 (50%) participants had graduated less than 10 years ago, 4 (10.5%) had graduated 11 to 20 years ago and 1 (2.6%) had graduated 31 to 40 years ago. Since IADT guidelines was first published in 2007, it would be expected that those who graduated well before that would have not known about the guidelines unless they updated themselves with current information and those who had graduated recently should be aware of the guidelines.

There was a CME lecture given on management of dental trauma a month before the questionnaires were handed out. This might be a confounding factor to the relatively high 'yes' responses to the question regarding if the participants had sought for any continuing education on management of traumatic dental injuries after graduation.

even out of ten participants considered their knowledge as sufficient and had an average score of 9 out of 10 correct answers. This indicates that

the participants' self-assessment equates to their knowledge. In comparison, Krastl *et al.* (2009) reported that two-thirds (61.3%) of their respondents considered their knowledge as sufficient with an average score of two correct answers out of five questions, and concluded that the self-assessment did not reflect the actual knowledge of the respondents. It is difficult to say whether the questionnaire result is a true picture or confounded by the CME lecture on management of dental trauma given a month earlier.

It is reassuring that all the participants (100%) knew that the critical time for treatment of avulsion is less than 60 minutes, and 81.6% knew that replantation is best done at the site of injury. Only 31.6% agreed that replantation should only be carried out at the dental clinic or A&E. This is lower than the 52.0% reported by Yeng and Parashos (2008). Specific reasons were not sought for why that is the case, but Yeng and Parashos (2008) speculated that it might be due to the possibility of non-dentally trained individual replanting the tooth incorrectly if not done at the dental clinic or A&E.

It is encouraging to note that 94.7% of the participants agreed that periodontal ligament necrosis would lead to replacement resorption, and that half of the participants knew that replacement resorption does not cause tooth mobility (it would lead to ankylosis). This is higher than the 11.1% reported by Yeng and Parashos (2008) regarding periodontal ligament necrosis leading to replacement resorption. However, it could be due to the way the question was worded that might cause biased responses. A correct statement was described in the questionnaire whereas Yeng and Parashos (2008) painted a wrong statement for a negative correct answer.

According to IADT guideline, endodontic treatment of a closed apex avulsed permanent tooth should not commence before replantation, but ideally only 7-10 days after replantation. About two-thirds (65.8%) of the participants agreed to this. In terms of splinting, 76.3% of the participants agreed in splinting the avulsed tooth for 4 weeks. This is close to Yeng and Parashos (2008) findings for the metropolitan dentists in which 82.0% agreed in splinting the avulsed tooth for 4 weeks. However, IADT guideline states that replanted permanent teeth should be splinted up to 2 weeks only. It

might be those participants who knew about IADT guidelines did not remember the finer details such as the splinting period.

It is reassuring to note that no participants chose glad wrap (polyethylene film), tap water and tissue paper as a physiologic storage medium for an avulsed tooth. Only half of the participants knew about Hank's Balanced salt solution as being one of the physiologic storage for an avulsed tooth. This is a higher percentage than that reported by Zhao and Gong (2010) and Yeng and Parashos (2008) with 15.8% and 3.0% respectively. Hanks Balanced salt solution is not readily available in Brunei and hence not many practitioners are aware of it.

Confidence levels in managing avulsion of permanent teeth

It would be thought that those participants who had worked for longer periods and those who experienced managing dental trauma would be more confident than newly graduated dentists and those with no experience with dental trauma respectively. However, majority of the participants agreed in being confident in managing the patient at A&E (81.6%) and disagreed to refer them to be treated in the clinic the next working day (92.1%) regardless of years of work and experience even though there were not enough materials available (as shown in Table 5). It is motivating to note that most of the participants were aware that time was a crucial factor in managing avulsion and seemed dedicated in treating the patient regardless of inadequate materials available.

The maxillary central incisors (normally with one root) are the most commonly affected teeth (Andreasen and Andreasen, 2007). It is interesting to note that 26.3% of the participants would refer the patient to an endodontist. It could be because the participants are not confident in managing the tooth themselves or there might be other reasons.

Twenty-two participants would not replant avulsed permanent teeth in all cases. There are individual situations when replantation is not indicated such as severe caries or periodontal disease, non-cooperative patient, and severe medical conditions such as immunosuppression and severe cardiac conditions (Andersson *et al.*, 2012).

Knowledge on follow-up management of permanent tooth avulsion

About two-thirds of the participants (71.1%) would normally refer their patient seen at A&E to the dental officer at peripheral clinic based on the patient's home address for follow-up management. It is encouraging to note that the majority (97.4%) of the participants would take a baseline periapical radiograph of a referred adult patient with avulsion at the first visit, and that all the participants (100%) would review the patient after endodontic treatment is completed. However, only 23.7% of them would continue the review annually for 5 years. IADT guidelines only mentioned that the replanted tooth should be monitored clinically and radiographically after 4 weeks, 3 months, 6 months, 1 year and yearly thereafter (Andersson *et al.*, 2012). It did not mention for how many years thereafter. However, Trope (2011) stated that it should be reviewed annually for at least 5 years. All the participants in this audit agreed that follow-up and review is needed, but they would stop reviewing at different lengths of time although none was ambitious enough to review for up to 10 years. Their answer would not reflect on the knowledge, but rather according to what they would actually do. Furthermore, the ideal answer would be after 4 weeks, 3 months, 6 months, then 1 year up to 5 years, whereas the tick boxes provided were only limited to one answer.

Barriers or limitations with regards to management of dental avulsion

A review by Yeng and Parashos (2008) taken from four published studies found that some of the perceived barriers faced by dentists were time constraints to long-term management of trauma cases, cooperation of child patient, inadequate fees and lack of confidence with the diagnosis and knowledge of appropriate care. This is very different from our findings. Of 28 first on-call participants in this audit, 64.3% of them mentioned lack of instruments, materials and equipment; 50.0% stated lack of assistance and staff support; 39.3% stated undesirable clinical settings (such as no dental chairs, poor lighting and no suction); and 17.9% were unfamiliar with A&E setting and had difficulty in finding materials and equipment they needed. It is interesting to note that 22 out of the 28 participants who are first on-call would get help from A&E staff, and only 8 of them would call the 2nd on-call over for help. The 2nd on-call would be of more help in terms of knowledge and

preparing materials such as mixing glass-ionomer cement and with moisture control. Some of the suggestions to improve emergency management of dental trauma at A&E were availability of dental chairs (46.4%); on-call dental assistants (35.7%); adequate instruments, materials and equipment (28.6%); availability of trauma kit (14.3%), educating medical officer regarding dental trauma (10.7%) and as well as guidelines or standard operating procedure in managing dental trauma (7.1%). Other suggestions included CME lecture/seminars on management of dental trauma, orientation of A&E settings for new dental officers on-call and a checklist to ensure all materials are available at A&E.

CONCLUSION

Although we fall short of the set standard, it seems that most primary oral care dentists' knowledge in the emergency management of avulsed permanent teeth is adequate. Regardless, there is still room for improvement on the primary oral care dentists' knowledge regarding management of dental trauma according to current guidelines available.

RECOMMENDATIONS FOR IMPROVEMENT OF FUTURE AUDIT:

1. Standardised way of distributing questionnaires to avoid bias such as online survey and timed.
2. An audit before a CME lecture or seminar on management of dental trauma and one after that to see if it made any difference in knowledge.
3. To record reasons for results obtained to gather more information.

RECOMMENDATIONS FOR A&E (TO BE FORWARDED TO THE HEAD OF PRIMARY ORAL CARE DIVISION):

1. Availability of dental chair in A&E.
2. To seek more assistance from 2nd on-call dental officers if needed.
3. Guidelines or standard operating procedure or manual on management of dental trauma available at A&E for quick reference.
4. Availability of trauma kit.
5. Educating the medical officer by having a CME lecture regarding emergency management of permanent tooth avulsion.
6. A checklist of materials available in A&E for the first on-call dentist to go through before the start of each on-call week.

7. Orientation of A&E for newly on-call dentists.

REFERENCES

- Abu-Dawoud M., Al-Enezi B. and Andersson L. (2007). Knowledge of emergency management of avulsed teeth among young physicians and dentists. *Dental Traumatology*, 23: 348-355.
- Andersson L., Andreasen J.O., Day P., Heithersay G., Trope M., DiAngelis A.J., Kenny D.J., Sigurdsson A., Bourguignon C., Flores M.T., Hicks M.L., Lenzi A.R., Malmgren B., Moule A.J. and Tsukiboshi M. (2012). International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 2. Avulsion of permanent teeth. *Dental Traumatology*, 28: 88–96.
- Andreasen J.O, Andreasen F.M and Andersson L. (2007). *Textbook and Color Atlas of Traumatic Injuries to the teeth, 4th Edition*. Denmark: Blackwell Munksgaard.
- Hu L.W., Prisco C.R.D. and Bombana A.C. (2006). Knowledge of Brazilian general dentists and endodontists about the emergency management of dento-alveolar trauma. *Dental Traumatology*, 22: 113-117.
- Krastl G., Filippi A. and Weiger R. (2009). German general dentists' knowledge of dental trauma. *Dental Traumatology*, 25: 88-91.
- Trope M. (2011) Avulsion of permanent teeth: theory to practice. *Dental Traumatology*, 27: 281-294.
- Yeng T. and Parashos P. (2008). An investigation into dentists' management methods of dental trauma to maxillary permanent incisors in Victoria, Australia. *Dental Traumatology*, 24: 443-448.
- Yeng T. and Parashos P. (2008). Dentists' management of dental injuries and dental trauma in Australia: a review. *Dental Traumatology*, 24: 268-271.
- Zhao Y. & Gong Y. (2010). Knowledge of emergency management of avulsed teeth: a survey of dentists in Beijing, China. *Dental Traumatology* 26; 281-281.

An audit of preoperative cleaning and disinfection of the dental chairs and surgeries in National Dental Centre (NDC) and four main government hospitals in Brunei Darussalam

Dr. Poh Wan Wen (@Patricia)¹, Dr. Hj. Amirul Rizan Hj. Mohamed² and Dr. Liaw Yi Huey¹
¹Infection Control Unit (Health and Safety Division),
²Division of Research and Development

INTRODUCTION

Cleaning means the physical removal of visible debris, microorganisms and the organic material on which they survive. On the other hand, disinfection removes most viable microorganisms on inanimate objects, with the exception of some viruses and bacterial spores (International Federation of Infection Control, 2011).

According to the UK Health and Social Care Act (2008) Code of Practice on the prevention and control of healthcare associated infections and related guidance, cleaned and disinfected treatment rooms are a must in any clinical practice to ensure the safety and health of the patients and staff, as well as to reduce the incidence of preventable healthcare-associated infections. Failure to comply with appropriate standards might lead to a charge of serious professional misconduct.

A national study on cross infection control within the United Kingdom (UK) orthodontic departments by Shah *et al.* (2009) found that 97.0% of the departments surveyed had separate 'clean' and 'dirty' zones within their clinical environment while disposable impervious barrier wraps were used by 79.0% of the departments. Almost all (92.0%) departments had a policy in place to disinfect the dental waterlines and suction tubing, however only 61.0% of the departments fill and drain the water bottles on a daily basis.

Comparatively, according to a systematic review by Oosthuysen *et al.* (2010) on the adherence of South African oral health care professionals to infection control recommendations, 93.8% and 83.0% of the respondents disinfected their working areas and light handles respectively. However, only 23.3% of dental hygienists applied barriers on equipment and 50.0% of them reported flushing

waterlines after each patient at the beginning and end of the working day.

Within the Department of Dental Services in Brunei Darussalam, the preoperative cleaning and disinfection procedures are not consistent and vary among the dental staff. There are also no standardised infection control guidelines within the department yet. Therefore, it is important to assess what infection control procedures are currently in place within our dental department and to compare them with the international guidelines.

AIM AND OBJECTIVES

The aim of this audit was to assess the current practice of preoperative cleaning and disinfection of dental surgeries and chairs among the dental surgery assistants (DSAs), dental nurses (DNs) and dental hygienist/therapists (DHTs) in National Dental Centre (NDC) as well as in the dental clinics of the four main government hospitals in Brunei Darussalam.

The objectives of this audit were:

- 1) to examine whether 'zoning' was practiced;
- 2) to assess whether clinical contact surfaces were barrier protected or disinfected between every patient;
- 3) to assess whether dental unit water lines (DUWLs) were flushed between every patient and water bottles were disinfected daily;
- 4) to identify the reasons for not carrying out these procedures.

STANDARD

It is important that all dental staff practice and incorporate good infection control into everyday clinical practice in preventing health care associated infection. Hence, 100% compliance should be expected. As there is no previous guideline in the dental department, it was then

proposed that the minimum compliance score of 75% for each objective be considered acceptable. The 'gold' standards for comparison were from the King's College London (KCL) dental institute infection control handbook and Infection Control Services (ICS) Ltd guidelines.

METHODS

An interview-based audit was conducted in a 3 week period from 10th to 29th November 2014. The proforma for the interview encompassed a series of 10 questions* which was constructed to cover the main objectives of this audit:

- 1) Management of instruments in the treatment area
- 2) Management of clinical contact areas
- 3) Management of DUWLs
- 4) Management of water bottles

The questionnaire was first piloted 2 weeks before the actual study in PAPHMHB Health Centre, Gadong to minimise inter-examiner bias between the interviewers (Dr. Poh Wan Wen @ Patricia and Dr. Liaw Yi Huey) and to evaluate the feasibility and time required for the actual study. Following amendments, all clinical DSAs, DNs and DHTs in NDC and in the dental clinics of the four main hospitals namely: Oral Surgery and Paediatric Dental Unit in RIPAS Hospital; PMMPHAMB Hospital, Tutong; SSB Hospital, Belait and PIHM Hospital, Temburong were included. Non-clinical dental staff and clinical dental staff who were on leave during the audit period or those working in the peripheral clinics were not included in this audit.

Microsoft Excel 2010 was used to enter and analyse the data collected. The number of YES responses for each objective was then assessed and the final score was then obtained by dividing the number of YES responses by the TOTAL of YES plus NO responses, multiplied by 100%.

$$\text{Score} = \frac{YES}{(YES+NO)} \times 100\%$$

As infection control procedures should be performed every working day and in between patients; therefore, it was decided that the number of SOMETIMES responses should also be considered as the number of NO responses.

RESULTS

Demographic Data

Of a total of 111 eligible clinical DSAs, DNs and DHTs in NDC and in the dental clinics of the four main hospitals; 103 (92.8%) participated, of whom 83 (80.6%) were female (Table 1). About four-fifths (37.9%) of the participants were in 20 to 29 year old age group, and 41 (39.8%) of the participants had worked with the dental department for more than 15 years. About two-fifths (44.7%) of the participants were DSA, and 39 (37.9%) participants were part of the Specialist Dental Services team.

Management of instruments in the treatment area

A total of 73 (70.9%) participants reported that they practised 'zoning' within their clinical environment, of whom only half (52.0%) from the DHT Training Unit had their clinical environment clearly separated (Table 2). Of a total of 34 DHTs, only 19 (55.9%) had separate 'clean' and 'dirty' zones. The set standard for this objective was not achieved. On the other hand, more than four-fifths (82.5%) of the participants only opened their instrument tray when required. In comparison, it was found that DSAs (32.6%) were more likely to open the instrument packs in advance of treatment than the DNs or DHTs. Similarly, this also applied to staff (i.e. DSAs, DNs and DHTs) who worked in the Adult Primary Oral Care Services (POCS) at 39.1%.

Management of clinical contact areas

The set standard for this objective was achieved. All 103 (100.0%) participants disinfected the clinical surfaces prior to a treatment procedure (Table 2). Unisepta and/or alcohol proved to be one of the more popular surface disinfectants and were used by nearly all (92.2%) of the participants. On the other hand, barriers were used by 80.6% of the participants and the DNs and DHTs were among the highest users (91.3% and 94.1% respectively). About 90% of these participants informed that these barriers were single-use and changed between each patient. With respect to which surfaces were disinfected and barrier protected, the results are illustrated in Figure 1.

* Please see note on page 43

Demographic information	Number (%)
Age	
20-29	39 (37.9)
30-39	27 (26.2)
40-49	33 (32.0)
50-59	3 (2.9)
≥60	1 (1.0)
Gender	
Male	20 (19.4)
Female	83 (80.6)
Years of service	
≤ 5	36 (34.9)
6-10	21 (20.3)
11-15	5 (4.9)
16-20	8 (7.8)
21-25	22 (21.4)
26-30	10 (9.7)
≥ 30	1 (1.0)
Post	
Dental Surgery Assistant	46 (44.7)
Dental Nurse	23 (22.3)
Dental Hygienist/Therapist	34 (33.0)
Type of service	
Primary Oral Care Services-Adults	23 (22.3)
Primary Oral Care Services-Children	16 (15.5)
Specialist Dental Services	39 (37.9)
DHT Training Unit	25 (24.3)
All combined	103 (100.0)

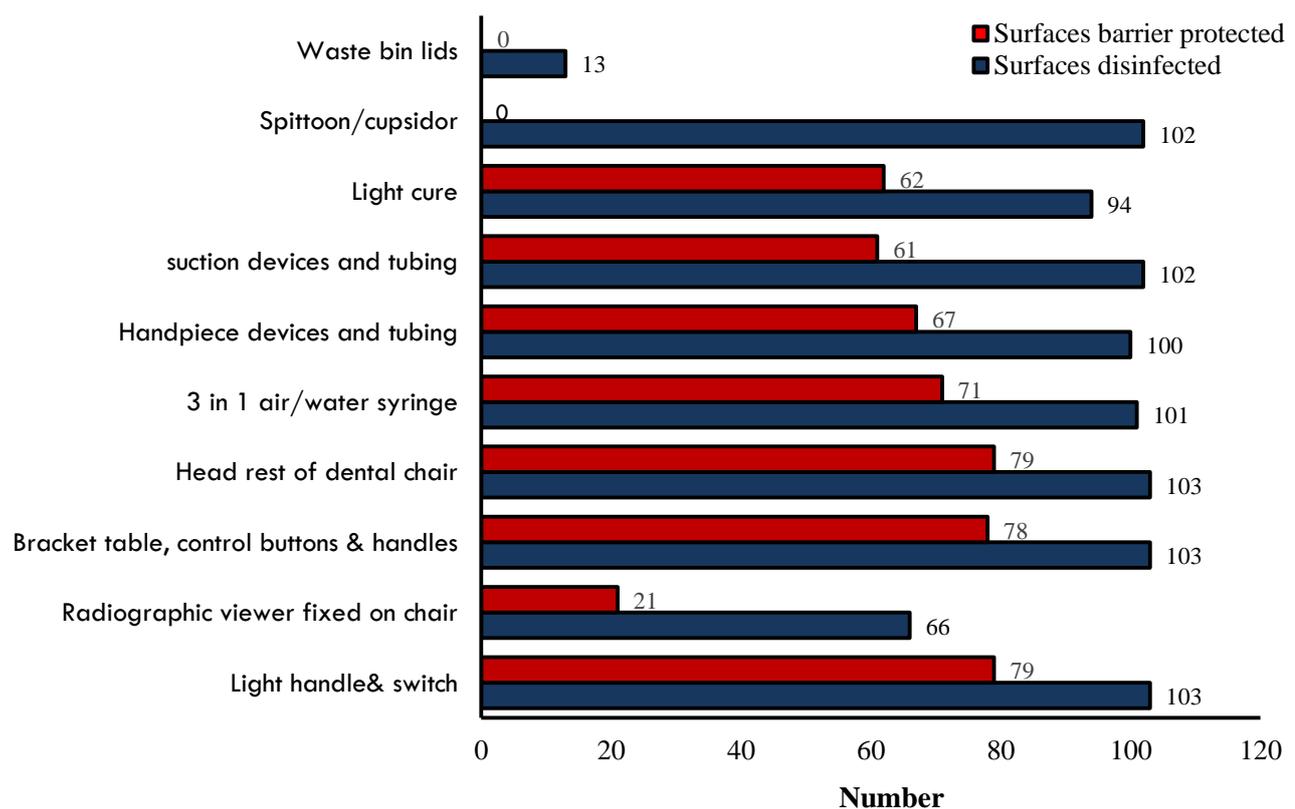


Figure 1. A bar chart to show the surfaces disinfected and barrier protected

Table 2. Number of 'yes' responses for each objective (bracket contains % of number of yes responses divided by number of each subcategory in the demographic data)

	Instruments in treatment area		Clinical contact areas		DUWLs		Water bottles			
	Zoning	Sterile packs not opened in advance	Surfaces disinfected	Surfaces barrier protected	Daily flushing (1-2min)	In between patient (1.5-30sec)	Disinfected at end of the day	Disinfected before refilling	Disinfected at end of the day	Kept dry & inverted overnight
Age										
20-29	29 (74.4)	32 (82.1)	39 (100.0)	32 (82.1)	8 (33.3)	6 (66.7)	5 (12.8)	0 (0.0)	1 (2.6)	19 (48.7)
30-39	17 (63.0)	22 (81.5)	27 (100.0)	20 (74.1)	11 (64.7)	2 (28.6)	1 (3.7)	1 (3.7)	2 (7.4)	17 (63.0)
40-49	24 (72.7)	27 (81.8)	33 (100.0)	28 (84.8)	10 (33.3)	2 (9.1)	0 (0.0)	1 (3.0)	3 (9.1)	18 (54.5)
50-59	3 (100.0)	3 (100.0)	3 (100.0)	2 (66.7)	1 (0.5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (33.3)
≥60	0 (0.0)	1 (100.0)	1 (100.0)	1 (100.0)	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)
Gender										
Male	15 (75.0)	13 (65.0)	20 (100.0)	12 (60.0)	6 (46.2)	2 (33.3)	3 (15.0)	1 (5.0)	1 (5.0)	6 (30.0)
Female	58 (69.9)	72 (86.7)	83 (100.0)	71 (85.5)	25 (41.0)	8 (23.5)	3 (3.6)	1 (1.2)	5 (6.0)	50 (60.2)
Years of service										
≤ 5	26 (72.2)	30 (83.3)	36 (100.0)	28 (77.8)	7 (33.3)	4 (44.4)	5 (13.9)	0 (0.0)	1 (2.8)	22 (61.1)
6-10	15 (71.4)	15 (71.4)	21 (100.0)	16 (76.2)	8 (53.3)	3 (100.0)	1 (4.8)	1 (4.8)	2 (9.5)	8 (38.1)
11-15	3 (60.0)	5 (100.0)	5 (100.0)	4 (80.0)	3 (60.0)	1 (25.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (60.0)
16-20	4 (50.0)	7 (87.5)	8 (100.0)	7 (87.5)	4 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	5 (62.5)
21-25	18 (81.8)	18 (81.8)	22 (100.0)	19 (86.4)	4 (21.1)	2 (12.5)	0 (0.0)	1 (4.5)	3 (13.6)	12 (54.5)
26-30	7 (70.0)	9 (90.0)	10 (100.0)	8 (80.0)	4 (44.4)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	5 (50.0)
≥ 30	0 (0.0)	1 (100.0)	1 (100.0)	1 (100.0)	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)
Post										
Dental Surgery Assistant	36 (78.3)	31 (67.4)	45 (100.0)	30 (65.2)	16 (34.8)	4 (8.7)	6 (13.0)	1 (2.2)	2 (4.3)	12 (26.1)
Dental Nurse	17 (73.9)	21 (91.3)	23 (100.0)	21 (91.3)	8 (36.4)	2 (12.5)	0 (0.0)	0 (0.0)	2 (8.7)	14 (60.9)
Dental Hygienist/Therapist	19 (55.9)	33 (97.1)	35 (100.0)	32 (94.1)	7 (20.6)	4 (11.8)	0 (0.0)	1 (2.9)	2 (5.9)	30 (88.2)

Table 2 (cont'd). Number of 'yes' responses for each objective (bracket contains % of number of yes responses divided by number of each subcategory in the demographic data)

Type of service	Instruments in treatment area		Clinical contact areas		DUWLs		Water bottles			
	Zoning	Sterile packs not opened in advance	Surfaces disinfected	Surfaces barrier protected	Daily flushing (1-2min)	In between patient (15-30sec)	Disinfected at end of the day	Disinfected before refilling	Disinfected at end of the day	Kept dry & inverted overnight
POCS (Adults)	15 (65.2)	14 (60.9)	23 (100.0)	11 (47.8)	9 (52.9)	1 (11.1)	1 (4.3)	0 (0.0)	1 (4.3)	7 (30.4)
POCS (Children)	10 (62.5)	14 (87.5)	16 (100.0)	13 (81.3)	5 (35.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	7 (43.8)
Specialist Dental Services	35 (89.7)	33 (84.6)	39 (100.0)	34 (87.2)	13 (41.9)	5 (35.7)	5 (12.8)	2 (5.1)	2 (5.1)	17 (43.6)
DHT Training Unit	13 (52.0)	24 (96.0)	25 (100.0)	25 (100.0)	4 (33.3)	4 (36.4)	0 (0.0)	0 (0.0)	3 (12.0)	25 (100.0)
	73 (70.9)	85 (82.5)	103 (100.0)	83 (80.6)	31 (41.9)	10 (25.0)	6 (5.8)	2 (1.9)	6 (5.8)	56 (54.4)

Management of DUWLs

Overall, only 31 (41.9%) participants performed daily flushing for 1 to 2 minutes at the start of the day, while 10 (25.0%) flushed in between patients for 15 to 30 seconds (Table 2). Males were more likely than females to flush daily and in between patients. In addition, participants from the Specialist Dental Services and DHT Training Unit (35.7% and 36.4% respectively) were more likely to flush in between patients than those from Adult Primary Oral Care Services (11.1%). On the other hand, only 6 (5.8%) participants disinfected the DUWLs at the end of the day; all were DSA, of whom 4 worked for the Specialist Dental Services. Figure 2 below illustrates which DUWLs were being flushed and disinfected.

Management of water bottles

The set standard for this objective was not met. A total of 97 (94.2%) participants reported that it was not a practice to disinfect the water bottles at the end of the day (Table 2). It was found that 2 of the 6 participants who disinfected the water bottles daily also disinfected them before refilling with distilled water. The most commonly used disinfectant was Hibiscrub. However, in terms of

draining down the water bottles, slightly over half (54.4%) of the participants had water bottles stored dry and inverted overnight and all of the staff (100%) from the DHT Training Unit were compliant in this matter.

Reasons of failure to carry out each objective:

a. Failure to practise zoning

Almost all participants (96.7%) who did not practise zoning reported that limited space was the main issue (Table 3). The only reason (100%) why staff chose to open the sterile packs in advance of treatment was due to the lack of time.

b. Failure to 'barrier protect' clinical contact areas

Nearly half (45.0%) of the staff reported that they did not use barriers because its supply was limited. Four participants (20.0%) only used them if they encounter any high risk patients. Three participants (15.0%) reported that some dentists prefer not to use barriers as they found it difficult or slippery to grasp the dental handpieces and 3 in 1 syringes when plastic sleeves were used.

c. Failure to flush DUWLs daily and in between every patient

About 30% of the participants reported that daily flushing was not possible at the start of the day due to the lack of time and for the same reason, 71.4% did not flush in between patients. With regards to disinfecting the DUWLs at the end of the day, “not aware” was the most prevalent reason (75.3%) and nearly one-fifth reported that there was no disinfectant available to carry out disinfection.

d. Failure to disinfect water bottles

The most common reason for failing to disinfect the water bottles whether before refilling or at the end of the day as well as failing to store the bottles dry and inverted was due to the fact that participants were not aware of such practices. The second most common reason was that the bottles were screwed to the dental chair, making them difficult or inconvenient to be removed. It was noteworthy to mention that four participants did not carry out the above objective simply because their dental chairs did not have independent bottled water systems.

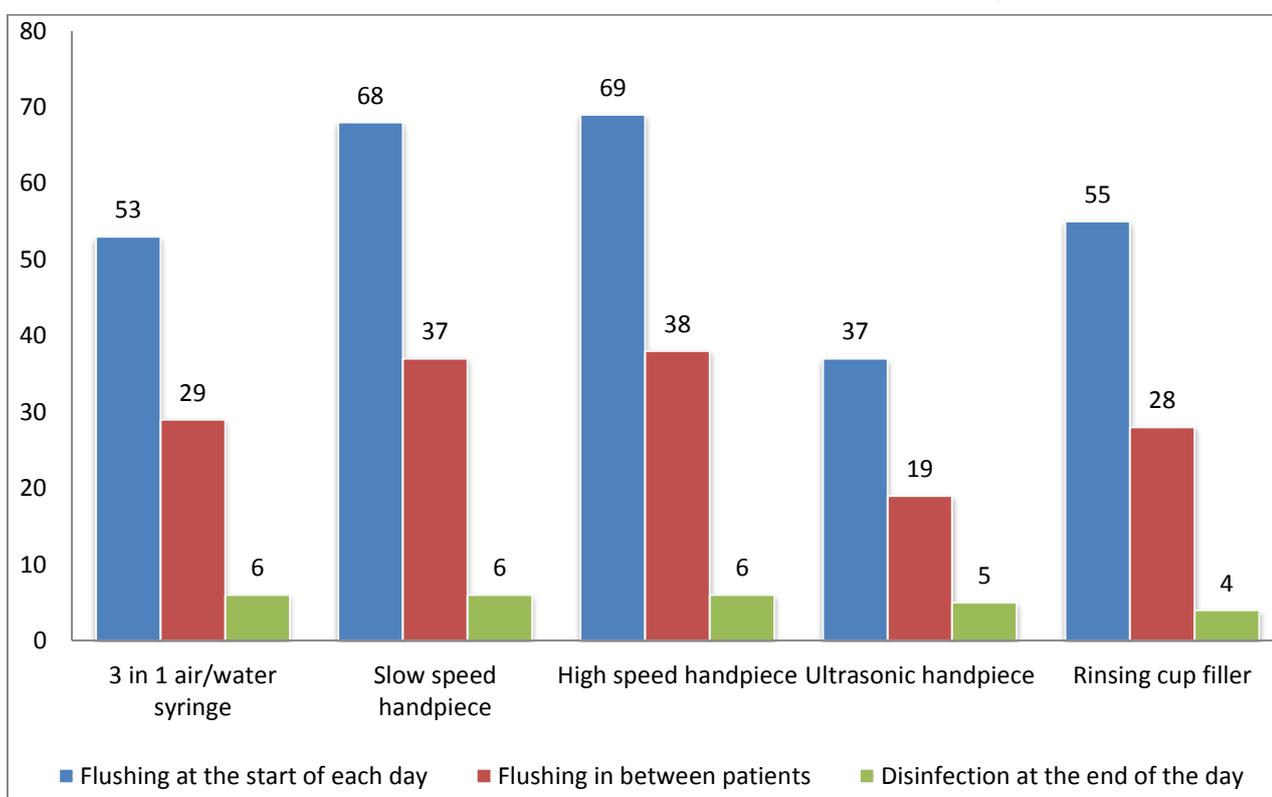


Figure 2. A bar chart to show which DUWLs were being flushed and disinfected

Table 3. Reasons for not carrying out each objective

No	Instruments in treatment area				Clinical contact areas	
	No zoning		Sterile packs opened in advance		Surfaces not barrier protected	
	Reasons	No. (%)	Reasons	No. (%)	Reasons	No. (%)
1.	Limited space	29 (96.7)	Limited time/ for convenience sake	18 (100.0)	Limited supply	9 (45.0)
2.	Dentist not organised	1 (33.3)			Lack of time	4 (20.0)
3.					Reserved for high risk patients	4 (20.0)
4.					Dentist’s preference	3 (15.0)

Table 3 (cont'd). Reasons for not carrying out each objective

No	DUWLs					
	No daily flushing (1-2min)		No in between flushing (15-30sec)		No daily disinfection	
	Reasons	No. (%)	Reasons	No. (%)	Reasons	No. (%)
1.	Lack of time	9 (31.1)	Lack of time	45 (71.4)	Not aware	73 (75.3)
2.	Not aware	7 (24.1)	Depends on usage	8 (12.7)	Disinfectant unavailable	18 (18.6)
3.	Fail to remember	5 (17.2)	Not aware	5 (7.9)	Medix is responsible	4 (4.1)
4.	Not necessary	4 (13.8)	Not necessary	3 (4.8)	Not necessary	1 (1.0)
5.	Only if required	3 (10.3)	Fail to remember	1 (1.6)	Lack of time	1 (1.0)
6.	No 'flush' button	1 (3.5)	No 'flush' button	1 (1.6)		

No	Water bottles					
	Not being disinfected before refilling		Not being disinfected at the end of the day		Did not keep bottles dry or inverted overnight	
	Reasons	No. (%)	Reasons	No. (%)	Reasons	No. (%)
1.	Not aware	72 (71.3)	Not aware	71 (74.0)	Not aware	18 (38.3)
2.	Difficult to remove water bottle	9 (8.9)	Difficult to remove water bottle	9 (9.4)	Difficult to remove water bottle	15 (31.9)
3.	Lack of time	6 (5.9)	Lack of time	4 (4.2)	Fail to remember	3 (6.4)
4.	Fear of contamination	6 (5.9)	Fear of contamination	4 (4.2)	Chair has no water bottle	4 (8.5)
5.	Chair has no water bottle	4 (4.0)	Chair has no water bottle	4 (4.2)	Distilled water remains	3 (6.4)
6.	Disinfectant unavailable	3 (3.0)	Disinfectant unavailable	3 (3.1)	Not convenient	2 (4.3)
7.	Not necessary	1 (1.0)	Not necessary	1 (1.0)	Not necessary	1 (2.1)
8.					Only during weekend	1 (2.1)

DISCUSSION

The importance of pre-operative cleaning and disinfection of dental chairs and surgeries cannot be overstated as this involves the safety and health of the patients and staff alike. In the light of this fact, this audit aimed to assess what infection control procedures are currently in place within our dental department and to compare them with the international guidelines.

It was decided that an interview-based audit would be more appropriate to collect the data instead of self-administered questionnaire survey. This is to reduce response bias and to allow the interviewers to observe the participants during the interview. Furthermore, a higher response rate would be expected, which in our case; the response rate was indeed high i.e. 92.8%. A pilot study was also carried out to minimise bias between the interviewers and to evaluate the feasibility and

time required for the actual study. Following this, the proforma was also amended accordingly to eliminate vague and confusing questions.

However, this audit also has its own limitations. Firstly, response given by the participants may be the ideal or correct answer but it does not necessarily reflect their actions. Secondly, the questions in the proforma were limited to certain chair designs and not applicable in others. Lastly, this audit did not assess all of the clinical DSAs, DNs and DHTs working in Brunei. Nevertheless, it was hoped that the responses elicited were more likely to be an accurate reflection of the current practice.

As our dental department has yet to have a guideline on preoperative cleaning and disinfection, it was then proposed that the minimum compliance score of 75% for each objective be considered acceptable. This audit is based on the KCL dental institute infection control handbook and ICS Ltd guidelines. Overall, management of instruments in the treatment area and the management of clinical contact areas were the only 2 main objectives that achieved the set standard. The findings of this audit will be discussed further according to the 4 main objectives of this audit.

Management of instruments in the treatment area

According to the 'gold' standards of this audit, zoning system should be utilised with 'clean' and 'dirty' areas clearly defined and "clean-to-dirty" work flow maintained so that used instruments are at a lower risk of coming into contact with decontaminated instruments. While it was near satisfactory that 70.9% of the participants practised 'zoning' within their clinical environment, the remaining one-third who failed to do so was mainly due to limited amount of working space. Despite this, it is still a must to maximise the separation of decontamination work from clinical activity within the constraints of space and room availability (UK Department of Health, 2013). It is suggested that the reprocessing area should be as far from the dental chairs as practicality allows, if instruments are reprocessed in the same room as the treatment area. However, if decontamination has to be carried out in the treatment room, appropriate controls should be in place to reduce the risks both to the patient and of cross-contamination of instruments. This should be highlighted and included in our future infection control guidelines.

On the other hand, it was encouraging to note that more than four-fifths (82.5%) of the participants only opened their instrument trays when required. Conversely, the DSAs (32.6%) as well as staff (i.e. DSAs, DNs and DHTs) who worked in the Adult POCS (39.1%) were more likely to open their instrument packs in advance of treatment. This is not surprising as primary oral care services are usually hectic; fast-paced and involve high job demands. Hence, in efforts to facilitate work flow, staff would opt to open the instrument packs earlier than required. However, it is important not to practise this because when sterile items are open to air, they will eventually become contaminated (Centers for Disease Control and Prevention, 2008). So, it is hoped that opening the sterile pouches only when required will reduce the number of microorganisms contaminating them.

Management of clinical contact areas

Clinical contact surfaces are surfaces that might come into contact frequently or become contaminated with blood or other potentially infectious material and subsequently contact instruments, hands, gloves or devices (Centers for Disease Control and Prevention, 2008). Thus, it was reassuring that all participants (100%) clean and disinfect the clinical surfaces between patients. This finding compares more favourably than the one reported by Oosthuysen *et al.* (2010) in which they found that 93.8% and 83.0% of respondents indicated disinfection of working areas and handles of lights.

On the other hand, only 80.6% used barriers for these surfaces mainly because its supply was limited. The same reason was also reported by dentists at two major dental hospitals and private clinics throughout Peshawar in a study by Khan *et al.* (2012). This is still acceptable and in line with the ICS Ltd guidelines which states that if impermeable plastic coverings are not used, then a surface disinfectant should be employed. When comparing between places of work, all of those who worked at the DHT Training Unit were more compliant than the Adult POCS participants (47.8%). This is likely to be due to the fact that all the staff of DHTTU was trained based on the KCL guidelines and they are less under the pressure of time as they provide services based on appointments.

It is also known that if barriers are used, they should be changed in between patients but in the present study, 10.8% of the participants did not do so because of the lack of time. This finding is also similar to the study conducted by Shah *et al.* (2009) who reported that 90% of the departments had a policy to change these barriers between patients while remainder (10%) only changed them either at the start of the day or a new session.

Management of DUWLs

Although, it was found that daily flushing at the start of the day and flushing in between patients has been carried out by majority of the participants, the amount of time that DUWLs are being flushed must also be considered. Therefore, only those that carried out flushing for the appropriate amount of time were taken into account. Due to this strict criterion, the standard for the management of DUWLs fell below 50%.

Only 7 (20.6%) DHTs practiced daily flushing for 1 to 2 minutes, and with regards to flushing in between patients for 15 to 30 seconds, only 4 (11.8%) were compliant. This finding is lower than what was reported by other studies. In a national survey of DHTs' infection control attitudes and practices within the United States, King and Muzzin (2005) reported that 57.0% of its participants flushed waterlines for 2 to 3 minutes at the beginning of the day. Similarly, 50.0% of dental hygienists in South Africa reported flushing waterlines for 30 seconds after each patient and 3 minutes at the beginning and end of the working day (Oosthuysen *et al.*, 2010). The difference in results between this study and the others could be due to the difference in the amount of time considered to be appropriate to flush the DUWLs.

In addition, it was found that participants from the Specialist Dental Services and DHTTU were more likely to flush in between patients than those from Adult POCS. Again, this is not surprising as Adult POCS staff are always busy and may not have the time to flush in between patients.

Regarding disinfection of the DUWLs at the end of the day, the figure was very low (5.8%). Majority reported that they were not aware of such practice and that it was policy to just disinfect the suction rather than the waterlines. This is very likely to be due to the fact that most of the dental chairs in this

study do not have the function of disinfecting the DUWLs. From this study, it was found that the KaVo dental chairs allow a safe intensive disinfection, which explains why only 4 DSAs from the Specialist Dental Services (specifically Endodontics and Restorative) were able to disinfect the waterlines according to the manufacturer's instructions. The remaining 2 DSAs who reported disinfecting the DUWLs is presumably to have not understood what was being asked of them. This was because the chair that was under their care was a Belmont Clesta II chair which does not have a disinfection function or at least not stated anywhere in its operating manual.

Management of water bottles

Besides the DUWLs, independent bottled water systems also have the potential to be contaminated. If the bottles are not disinfected on a daily basis and stored dry, the interior of the bottle can also become colonised with both skin and water microbes (Pankhurst, 2003). These microbes can then proliferate in the stagnant, room temperature water and contaminate the waterline. This is therefore worrying because in this present study, only 6 (5.8%) participants disinfected the water bottles at the end of the day and only 2 participants (1.9%) disinfected before refilling.

Moreover, the most commonly used disinfectant was Hibiscrub skin cleanser. This formulation may not be strong or toxic enough to destroy or inhibit the growth of all microorganisms as Hibiscrub is an antiseptic used on living tissue rather than on inanimate objects or surfaces. It is suggested that sodium hypochlorite would be a better alternative as a disinfectant because it is not only economical and effective but also easily available within the dental department. Besides that, experimentally only sodium hypochlorite, Alpron, Sterilox and Bio2000 have been shown to completely remove the total viable counts of bacteria in the water as well as reduce the biofilm coverage (Chate, 2006). These tested disinfectants are also the ones that have been recommended by the ICS Ltd.

In terms of draining down the water bottles, only 54.4% of the participants had water bottles stored dry and inverted overnight. However, it appears to be a standard procedure for all the staff who worked in the DHT Training Unit as all of them (100%) were compliant in this matter.

Undoubtedly, this is not seen among the DSA, where only 12 (26.1%) were compliant. Regarding the policy for daily draining of water bottles, this study scored lower than the 61.0% reported by Shah *et al.* (2009).

Overall, such negligence resulted because of the lack of awareness among the staff. Due to this fact, it is imperative that all dental staff must be educated about the risk of microbial contamination of waterlines and water bottles if necessary measures are not taken on a daily basis.

CONCLUSION

In conclusion, the overall management of instruments and clinical contact areas among the clinical DSAs, DNs and DHTs in NDC and in the dental clinics of the four main hospitals were satisfactory. However, as predicted, the findings from this study confirmed that the staff did not fully comply with the 'gold' standards for the management of DUWLs and water bottles. It is the responsibility of every member of the dental team to control diseases and prevent them from spreading. Thus, this audit highlights opportunities for improvement and further research. Suggested areas of improvement can be found below.

RECOMMENDATIONS

1. To produce our own infection control manual handbook and where appropriate, KCL and ICS Ltd guidelines will be referenced.
2. To educate all the dentists, DSAs, DNs and DHTs about cross infection control according to the proposed manual and guidelines by conducting a CME lecture or a seminar.
3. Mandatory training of staff upon commencing employment with regular updates.
4. Pictorial images, e.g. technique on flushing the DUWLs near the dental chairs is a good means of encouraging staff to comply with accepted practice.
5. A checklist or reminder of "Dos and Don'ts" should be clearly displayed in each dental surgery
6. Materials required for cross infection control should be made available throughout at every dental clinic in Brunei.
7. Staff should be reassessed again after the above interventions have been taken place and yearly thereafter.

8. Future audits should involve all clinical DSAs, DNs and DHTs in dental clinics of all hospitals, health centers and clinics. Future questions in the proforma should consider the different dental chair designs available in Brunei.

REFERENCES

- Centers for Disease Control and Prevention (2008). Guideline for Disinfection and Sterilization in Healthcare Facilities. Available from http://www.cdc.gov/hicpac/Disinfection_Sterilization/13_0Sterilization.html [Accessed 28th January 2015].
- Chate R.A.C. (2006). An audit improves the quality of water within the dental unit water lines of three separate facilities of a United Kingdom NHS Trust. *British Dental Journal*, 201 (9): 565-569.
- Infection Control Services Ltd (2006). Surgery disinfection and waste management. Available from http://www.infectioncontrolservices.co.uk/dental_surgery_disinfection.htm [Accessed 22nd May 2014].
- International Federation of Infection Control (2011). Cleaning, disinfection, and sterilization. Available from http://www.theifc.org/basic_concepts/chapter12.pdf [Accessed 22nd May 2014].
- Khan A.A., Javed O., Khan M., Mehboob B. and Baig S. (2012). Cross infection control. *Pakistan Oral & Dental Journal*, 32 (1): 31-35.
- King's College London (2008). Dental institute infection control handbook.
- King T.B. and Muzzin K.B. (2005). A national survey of dental hygienists' infection control attitudes and practices. *Journal of Dental Hygiene*, 79 (2): 1-13.
- Oosthuysen J., Potgieter E. and Blignaut E. (2010). Compliance with infection control recommendations in South African dental practices: a review of studies published between 1990 and 2007. *International Dental Journal*, 60: 181-189.

Pankhurst L.C. (2003). Risk assessment of dental unit waterline contamination. *Primary Dental Care*, 10 (1): 5-10.

Shah R., Collins J.M., Hodge T.M. and Laing E.R. (2009). A national study of cross infection control: 'are we clean enough?' *British Dental Journal*, 207 (6): 267-274.

UK Department of Health (2008). Clean, safe care: reducing infections and saving lives. Available from <http://antibiotic-action.com/wp-content/uploads/2011/07/DH-Clean-safe-care-v2007.pdf> [Accessed 24th May 2014].

UK Department of Health (2013). Decontamination Health Technical Memorandum 01-05: Decontamination in primary care dental practices. Available from <https://www.gov.uk/government/publications/decontamination-in-primary-care-dental-practices> [Accessed 28th Jan 2015].

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If you require assistance with any aspects of clinical auditing, please do not hesitate to contact:

Dr. Grace Ang, Head of CAD

(grace.ang@moh.gov.bn; angjess@yahoo.com)

Dr. Hjh. Wardati Sahimin binti Hj. Yakob, Co-Deputy-Head of CAD

(wardati.yakob@moh.gov.bn)

Dr. Jacqueline Keasberry, Co-Deputy Head of CAD

(jacqueline.keasberry@moh.gov.bn; jacsenyum@gmail.com)

Or any other members of CAD:

Dr. Jacqueline Maryam binti Kamaluddin, National Dental Centre, Berakas

Dr. Wizziyane binti Hj. Ahmad/ Md. Ariffin, National Dental Centre, Berakas

Dr. Hj. Amirul Rizan bin Hj. Mohamed, National Dental Centre, Berakas

Dr. Hj. Mohin bin Hj. Momin, Raja Isteri Pengiran Anak Saleha Hospital, BSB

Dr. Hj. Muizzaddin bin Dato Paduka Haji Abdul Mokti, National Dental Centre, Berakas/ Raja Isteri Pengiran Anak Saleha Hospital, BSB

Dr. Uday K. Umesan, National Dental Centre, Berakas

Dr. Hj. Alias bin Embong, National Dental Centre, Berakas

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