REPORT OF THE INVESTIGATION PANEL ESTABLISHED TO CONSIDER DATA ERRORS MADE IN THE FINAL MB EXAMINATION IN JUNE 2009

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December 2009

EXECUTIVE SUMMARY

Background to the establishment of the investigation

1. The attached report details the full findings and recommendations arising from the investigation which has taken place following the identification of serious data errors in the results which had been confirmed at the Final MB Examining Board held in the School of Medicine on 24 June 2009. The Vice-Chancellor commissioned this investigation in September 2009 to establish the extent, nature and reasons for the data errors and to ensure that all necessary actions are being and will be taken to avoid any recurrence.

2. The University has maintained close contact with the General Medical Council (GMC) in relation to the events following the identification of the data errors and to the direct impact on students following the correction of their results. From the outset the University had confirmed that it would be mindful of any observations that the GMC may have had in respect of the conduct of this investigation. As a result of concerns that the GMC did raise the scope of the investigation was broadened to cover a number of other data errors that it was later revealed had occurred. The full details of this are fully documented in the attached report.

3. The terms of reference and membership of the investigation are contained in the attached report (Appendix 1).

Conduct and general conclusions of the investigation

4. The Investigation Panel met on three occasions, in October, November and December 2009. Meetings were held with a number of academic and administrative staff from the School of Medicine. The Panel has particularly valued the School of Medicine's full co-operation over the course of the investigation: its frank and open approach was very helpful and greatly facilitated the Panel's work throughout the course of the investigation. The Panel also met a small number of student representatives. Their input, which included a written report from 2007 and a clear oral explanation of their concerns in relation to their assessment and that of the students whom they represented, was also very helpful.

5. In addition to these sources, the Panel received other written evidence following the confirmation at Senate of the Panel's establishment and revised terms of reference. The Panel has sought responses from the School of Medicine in respect of all of the matters that were brought to its attention.

6. The Investigation Panel has established that the specific data errors that occurred in relation to 2008/2009 data processing originated directly from manual deficiencies in the data handling processes and in the manipulation from raw data into Excel spreadsheets. On the face of it, these errors were simple in nature, but their impact has been traumatic for the students concerned and potentially highly damaging for the reputation of the School of Medicine and of the University. Moreover, their occurrence, and the fact that the errors were not identified within the School's management structures prior to Examining Boards being held, illustrates a more fundamental and systemic failure in the management of its assessments and of the data generated from them. The Panel was clear that the shortcomings in the School's governance over these matters, that were revealed by this and other past episodes to which its attention was drawn, are serious, of a significant scale, and require urgent corrective action.

7. Whilst concluding that there have been serious failings in the governance and management of data processing within the School, the Panel wishes to make it clear that none of the concerns that have been raised have cast any doubt on the academic standards of the Cardiff MBBCh or of its comparability with the equivalent awards of other institutions in the sector.

8. We set out below our more detailed conclusions followed by a set of recommendations. We are aware of steps that the School is taking and proposes to take that aim to address the matters set out below, but the Panel's conclusions and recommendations are presented as they were first formulated and agreed.

Detailed conclusions

9. The Investigation Panel has **CONCLUDED** that the following constitute **a serious risk to the overall governance and management of assessment processing** in the School of Medicine:

   i) From the organisational structures of the School it does not appear that there is any single person/postholder with a clearly designated responsibility and authority that spans the entirety of the assessment management process. This failure is compounded by the fact that the line management arrangements for the staff are not common across the assessment function. Whilst not doubting the commitment and dedication of individual members of staff, it appears that on a day-to-day basis work is being conducted by individuals with no holistic leadership or direction. Nor is any transparent method applied to ensure a common sense of purpose and understanding as to the respective responsibilities that individuals have, or as to how each of the components in the process is linked to the

others, so as to assure probity in the profiles of assessment results.

ii) The lack of a robust database in the School for recording assessment data.

iii) The lack of a clear and articulated understanding of the roles and responsibilities that key personnel have in the administrative process of handling marks.

iv) The lack of understanding of the process itself on the part of the senior managers who were managing the administrative staff.

v) Inappropriate assumptions as to the veracity of data being received by Examining Boards.

vi) Insufficient checking of data at all stages of the process coupled with the absence of any protocols that set out clearly either the validation or the auditing to be undertaken prior to the presentation of full and complete data to an Examining Board.

vii) The lack of any clear academic or administrative leadership or direction in the absence of the Sub Dean for Assessment and the Undergraduate Office Manager, aggravated by the inadequate arrangements that the School made to manage these absences.

10. The Investigation Panel has **CONCLUDED** that the following constitute **a serious risk to the operational delivery of assessment processing** in the School of Medicine:

i) Logistical difficulties arising from office layout and space issues: the scanning of mark sheets was taking place at some distance from the undergraduate office and there was a lack of space for scanning and storage of mark sheets.

ii) Operational shortcomings in training staff appropriately for the use of the scanning software.

iii) The lack of any defined protocols for the use of the scanning software.

iv) The use of additional School-based candidate numbers which has both added to the complexity of the operational processes and required additional effort to transpose those numbers accurately against the University's student identifier numbers.

Recommendations

11. The Panel **RECOMMENDS THAT** the following actions are required to address the weaknesses that have directly contributed to the data errors that occurred in June 2009. These are summarised here and full details are included in the report. **Some of them require immediate action. The Panel stresses to both the School of Medicine and to the University that without such actions being undertaken and their actual or likely effectiveness promptly ascertained and revised as appropriate,**

the confirmation of assessment outcomes during 2009/2010 will be running at serious risk.

R1 The School should clearly designate a single postholder to have overall authority and responsibility for the governance and management of assessment data. This is essential to ensure a holistic, joined-up approach across the totality of the data processing activities being carried out in the School.

R2 Following on from R1 above, all other personnel contributing to the delivery and processing of assessments in the School of Medicine should have their own roles and responsibilities explicitly defined. Whilst recognising that organisational structures rest with the School, the Panel is concerned that the current matrix management method is compromising clear lines of authority within the assessment process. The Panel **RECOMMENDS** that this is given particular attention if the School proceeds as desired with the appointment of an Assessment Data Manager, so as to ensure that there are clear reporting lines between this post and the Undergraduate Operations Manager.

R3 The School should instigate team building activities across all personnel involved in the delivery and processing of assessments in the School: a key objective should be to ensure that personnel understand the 'bigger picture' and their own vital contribution in ensuring the rigour and probity of operational activities.

R4 Data management protocols must be documented and should detail:

i) the procedures for ensuring the collation of a complete data set of assessment marks for all students;

ii) all stages associated with the processing of data from its initial arrival in the Undergraduate School Office through to the publication of results and feedback to students.

These protocols should clearly identify timelines for the completion of these various tasks, together with clear specification of relevant roles and responsibilities within the School. The protocols should include a fully populated flow diagram that clearly shows all of the stages in the process. Staff training should be conducted on a regular basis against these protocols; recognising that there may be a natural turnover of staff or that staff will need to re-familiarise themselves with operational protocols prior to times of peak usage during the annual cycle

R5 Systems for verifying and checking data at all stages of the process should be specified. This specification should include confirmation of the means by which the School will audit the systems. Individual responsibilities for conducting such verification and auditing should be explicit and confirmed to the relevant postholders.

R6 The School must confirm to the University the means by which it will hold and manipulate assessment data for the session 2009/2010. It has identified the need to develop a new single database to support the management of the Examining Board processes for all years of the MBBCh. The School regards this as the workable option for the short to medium term but in the longer term is committed to using the University's Student Information Management System for the management of its student data.

R7 The School must establish clear protocols for data integrity in relation to the operation of the database: as a matter of principle this should include restricting access to change data to a small number of defined personnel.

R8 The School must ensure that it develops its expertise in the use of the scanning software. This will include exploring the full functionality of Remark 7 and establishing whether this is the best software for these purposes.

R9 The School of Medicine must cease the use of its own candidate numbers for students and use instead the University number as the unique identifier for each student. The Panel was concerned that there is no University consensus on this issue and that the School of Biosciences apparently wishes to retain the use of its own candidate numbers for MBBCh students. The University must take a view on whether a consistent approach on this matter would not be preferable, recognising that inconsistent approaches carry both the potential and, in this case, actual risk of error. The Panel was left in no doubt that had a single student number been used, the School would have been able to identify the data errors more readily.

R10 The School should set aside secure and adequate space in which to undertake effective data management.

R11 All communications issued to students, and particularly those relating to assessment matters, must be accurate and complete. This should cover the whole MBBCh programme, including both the School of Biosciences and the School of Medicine. The Panel further **RECOMMENDS** that the University consider whether it would be desirable in the interests of the students' experience to bring about a much closer alignment between the two Schools.

12. The Panel is aware of a range of further actions that are being instigated by the School of Medicine as a result of their current review of assessment. The Panel **ENDORSES** the following School actions as they are consistent with the recommendations set out in paragraph 11.

E1 The appointment of a dedicated Assessment Data Manager who has particular skills in using databases and a sound understanding of the assessment process.

E2 The establishment of a dedicated space in the Undergraduate Office for data scanning and the planned co-location of the Sub-Dean for Assessment and the new Assessment Data Manager

E3 Bringing forward the Final MB written papers from June to early May 2010. This will ensure that the School has more time for the processing of results from these written papers, which work will not run alongside the organisation of the OSCE assessment.

13. The scale of work required is considerable and will involve significant staff effort, commitment and dedication to ensure that these actions are successfully implemented. The Panel's **RECOMMENDATION is that it is essential that**:

R12 these actions are planned and managed through a project management framework, with clear lines of communication, accountability, reporting and risk management: operating by such a project framework will require timescales to be defined against which progress can be measured

R13 both the School of Medicine and the University undertake regular and close monitoring of delivery against the agreed framework; the means by which such monitoring will take place should be clarified, but at a minimum the University must be assured before the Examination period commences that the School has implemented all those actions that have been identified above and that it is as a consequence confident of the integrity of its assessment processes for 2009/2010

R14 the resources necessary for the delivery of the actions set out in paragraphs 11 and 12 are identified and allocated.

Investigation Panel
December 2009

FULL REPORT

1.1 BACKGROUND TO THE INVESTIGATION: AN OVERVIEW

1.1.1 This report details the full findings and recommendations arising from the investigation which has taken place following the identification of serious data errors in the results which had been confirmed at the School of Medicine's Final MB Examining Board held on 24 June 2009. In his capacity as Chair of the University's Awards and Progress Committee the Vice-Chancellor commissioned the investigation on 4 September 2009. At that point it was known that:

i) A result of Fail had been confirmed for one candidate at the Final MB Examining Board held on 24 June 2009. Following the verification process prompted by the candidate's appeal, it was discovered that there had been a data error in the transposition of marks in one assessment: the candidate had in fact passed the assessment and had satisfied the requirements for the award of the MBBCh. The award of the MBBCh was confirmed by the Acting Vice Chancellor as Chair of the Awards and Progress Committee on 12 August 2009.

ii) A result of Pass had been confirmed for four candidates at the Final MB Examining Board held on 24 June 2009. The discovery of the data error in the mark profile for this one assessment in turn revealed that these four candidates had not in fact passed, and therefore had not satisfied the requirements for the MBBCh and did not have a valid award. The award of the MBBCh for these four candidates was rescinded by the Acting Vice Chancellor as Chair of the Awards and Progress Committee on 19 August 2009.

Paragraph 1.4 below gives a detailed explanation of the sequence of events which took place following the identification of the data errors in August 2009 as key contextual information for the conduct of this investigation.

1.1.2 The investigation was undertaken during mid October to mid December 2009, the three sessions being scheduled around the Panel members' availability. It is important to note that this investigation and the conduct thereof has been undertaken completely separately to the individual appeals and complaints which were received from those students directly affected by the data errors. Those appeals and complaints have been determined in accordance with the University's Verification and Appeals Procedure and the Student Complaints Procedure. Whilst the appeals and complaints were known to be running concurrently with the conduct of the investigation, the Vice Chancellor considered them to be outside the remit of the Panel's investigation and were not included in its terms of reference.

1.1.3 Over the course of these events the University has maintained close contact with the General Medical Council (GMC) as the relevant Professional Body. From the outset the University had confirmed that it would be mindful of any observations that the GMC may have had in respect of the conduct of the investigation. As a result of concerns that the GMC did raise before the Investigation Panel had commenced its work the original terms of reference for the investigation were revised to take account of them. Full details are provided below at 1.3.

1.1.4 The University also confirmed the establishment of the investigation with the Minister for Health at the Welsh Assembly Government. The University will provide the Minister with a copy of this final report.

1.2 MEMBERSHIP

1.2.1 The Vice-Chancellor was clear that the membership of the Investigation Panel should include a senior member of staff from a comparable Medical School who could provide expert and independent advice. Professor Peter Mathieson, Dean of Medicine and Dentistry at the University of Bristol, kindly agreed to join the Panel, and the investigation has benefited enormously from his knowledge and expertise. Prior to the invitation, the University had confirmed that Professor Mathieson had no close working arrangements with the School of Medicine, such as being an existing or recent External Examiner, which might compromise an independent input. The further membership of the Investigation Panel was established to ensure input from:

i) a senior member of academic staff from Senate with an expert knowledge and experience of quality assurance and standards;
ii) a senior member of management staff with an expert knowledge and experience of University governance;
iii) a lay member of Council; and
iv) a senior member of academic staff from a health-related subject other than Medicine and with a knowledge of professional body requirements.

1.2.2 The Vice Chancellor approved the following membership of the Investigation Panel:

- Professor David Miers, Cardiff School of Law (in the Chair)
- Professor Peter Mathieson, Dean of Medicine and Dentistry, University of Bristol
- Dr Christopher Turner, Director of Registry, Governance and Students.
- Mr Gethin Lewis, lay member of Council
- Professor Paul Dummer, School of Dentistry

- Mrs Jill Bedford, Director of Registry and Academic Services (Secretary).

1.2.3 At the Panel's first meeting the following declarations of interest were made:

i) Mr Gethin Lewis confirmed that he is a lay member of the Admissions Committee in the School of Medicine;

ii) Dr Christopher Turner confirmed that he is a member of the University's Awards and Progress Committee.

It was agreed that neither of these declarations would compromise the proceedings or the legitimacy of these members to serve on the Investigation Panel.

1.2.4 At the first session on 22 October 2009 the Panel considered whether it should include student representation. It was agreed that whilst student membership of the Panel was not considered appropriate given the nature of the investigation, it would be vital to ensure a student input into the proceedings. The Panel met a group of 4th and 5th year student representatives at its session on 19 November 2009. The Panel is grateful to the Sabbatical Officer for the Heath Park Schools for his assistance in making the arrangements for this meeting.

1.3 TERMS OF REFERENCE

1.3.1 In September 2009 the Vice-Chancellor approved the investigation's initial terms of reference. They were, however, revised at the GMC's request following its letter of 21 October 2009 which referred to other possible data errors on the MBBCh that had been reported to it. The GMC asked the University to broaden the Panel's terms of the reference to include the investigation of these additional reports. The letter also asked that the University provide clear details on timelines for completion of the work to be undertaken and to confirm the designation of responsibilities.

1.3.2 The GMC's letter was reported to the Investigation Panel's first meeting. Detailed information about the possible data errors to which this letter referred and about the extensive investigative processes that the Panel then required in respect of them and of the errors of which it was already aware are set out below at Section 2. The Panel considered the impact of these reports of further data errors on the scope and conduct of its work. Its initial terms of reference had explicitly stated that the Panel was established for two purposes. The first was in order that the University and the GMC could have the necessary confidence and reassurance in the confirmation of assessment outcomes in the School of Medicine. The second was that all necessary actions were being taken to avoid any recurrence of the events that had

led to the investigation. The Panel quickly recognised that if such confidence and reassurance was to be achieved it would be necessary to widen the scope of its investigation. It would need to examine not only all the identified and reported data issues arising from the evidence received to date, but also any errors emerging as a result of the process of checking the assessment results. A holistic approach to the investigation should involve:

i) The incorporation within the scope of the investigation of all data errors however identified, so that their causes and their impacts could be explored extensively with the School of Medicine, and
ii) The identification of all of the factors that had contributed to these errors and of the actions needed to assure all relevant stakeholders that data probity on the MBBCh could be confirmed.

1.3.3 Following its recommendation to him, the Vice-Chancellor approved that the Panel's terms of reference be amended to cover all of these matters. A copy of the revised terms of reference was sent to the GMC. They are appended to this report (Appendix 1).

1.4 DETAILED ACCOUNT OF EVENTS LEADING UP TO THE INVESTIGATION

1.4.1 The identification of the data error that prompted the investigation originated from an appeal made by a final year student following the Fail decision confirmed by the Final MB Examining Board held on 24 June 2009. As a result of the School of Medicine's verification of data in relation to this individual appeal it was established that the marks for the Extended Matched Question (EMQ) assessment had been incorrectly assigned to this and to other candidates. The EMQ paper is one of two written papers that combine to form the Knowledge and Understanding module which is a component of the overall assessment for the Final MB examinations. The EMQ paper accounts for 70% of the total marks for the Knowledge and Understanding module. Candidates are required to achieve a combined mark of 50% or more to pass the module, which they must pass if they are to satisfy the requirements for the award of the MBBCh.

1.4.2 Subsequent to the identification of the data error the School of Medicine undertook an immediate and extensive review of the data that had been received by the June Examining Board. Over the period 12/13 August this included:

i) manually checking the MBBCh Finals mark sheet to confirm that the EMQ marks for all MBBCh candidates were correctly matched;

ii) ensuring that the marks for each element of the EMQ papers had been manually added up, checked, and were arithmetically correct for all other students who had had a Fail result confirmed by the June Examining Board: this exercise confirmed that there were no calculation errors in the EMQ marks recorded for these candidates;
iii) ensuring that the marks for each element of the EMQ papers were arithmetically correct for a sample of all other candidates (the sample amounted to 50% of the candidates): this exercise confirmed that there were no calculation errors in the EMQ marks recorded for these candidates;
iv) ensuring that the marks for the Data Interpretation and OSCE assessments had been manually added up, checked, and were arithmetically correct for all failing candidates: this exercise confirmed that there were no errors in the Data Interpretation and OSCE assessments for all failing candidates; and
v) a comparison of the marks returned for candidates assessed in 2009 with those of the 2008 candidates to ensure that the standard settings for 2009 were appropriate and should not be modified any further.

1.4.3 This verification process revealed that in addition to the one candidate previously recorded as failing Knowledge and Understanding and who now presented with a mark of more than 50%:

- there had been a data error in the marks assigned to 137 other students considered by the MBBCh Examining Board in June 2009; and
- as a consequence of correcting the error, four of the candidates within this cohort previously recorded as passing Knowledge and Understanding now presented with a mark of less than 50%.

1.4.4 As noted above (at 1.1.1 i), as a result of the appeals process action was taken on 12 August 2009 to confirm the award to the candidate who it had now been established had satisfied the requirements for the MBBCh. Following confirmation to the GMC of the student's eligibility for the Medical Register (via the University of Wales as the awarding body for the MBBCh), the student was able to take up the allocated Foundation Year 1 (FY1) post.

1.4.5 The School of Medicine recognised that the position of the four candidates who presented with a failing mark on the EMQ paper was a matter of the utmost urgency as all four had commenced their allocated FY1 posts on 1 August 2009. There were compelling issues of fitness to practise and patient safety to address. In accordance with the School's standard procedures a meeting of the Examining Executive was held on 13 August 2009,

which reported to a Re-Convened Examining Board held on 14 August 2009. The Examining Board recommended that the four candidates had not satisfied the requirements for the award of the MBBCh; on the same day the School made arrangements to notify them of the Board's recommendation. The Dean of Medicine met each of them separately on Monday 17 August 2009.

1.4.6 As noted above at 1.1.1 ii), on receipt of the Examining Board's recommendation the Acing Vice Chancellor, as Chair of the Awards and Progress Committee, took formal action on 19 August 2009 to rescind the award of the MBBCh degrees to the four students. This action was confirmed to the University of Wales as the awarding body for the MBBCh. The action to rescind awards is taken by the Awards and Progress Committee where an award has been conferred to a student but an error has subsequently been identified, the consequence of which is that the criteria for the award of the degree are not satisfied. In cases where degrees are rescinded students are given a further opportunity to achieve the intended award. In this case, the Examining Board had confirmed that the four students would be permitted to repeat the final year of the MBBCh programme.

1.4.7 At its meeting on 14 August 2009 the Examining Board recognised that the data error also had a potential impact on the classification of awards for all final year students, and that further rigorous verification was needed in case any further decisions were required. The Reconvened Examining Board held on 22 October 2009 considered the outcomes arising from this verification and confirmed that the classifications for 3 further students should be raised following the correction to their marks.

2. CONDUCT OF INVESTIGATION

2.1 EVIDENCE COLLECTED

2.1.1 The Investigation Panel held three sessions: on 22 October 2009, 19 November 2009 and 15 December 2009. Evidence collected by the Panel over the course of its investigation came from:

i) statements arising from the validation of data undertaken by the School (see 2.2 below);
ii) meetings with academic, managerial and administrative staff from the School of Medicine, including the Dean of Medicine;
iii) a meeting with MBBCh student representatives from current 4th and 5th year cohorts;
iv) written submissions from the School of Medicine including
    - a report submitted by the Clinical Sub Dean for Assessment;

- a statement of the School's structural arrangements for the co-ordination and management of assessment, with designated individual responsibilities;
- a flow diagram for the assessment process: from student completion of the assessment through to confirmation of outcome;
- responses to specific requests from the Panel for information/clarification;

v) general information on the programme including the programme structure, the schedule of assessments, programme handbooks;

vi) correspondence from the GMC; and

vii) a statement from one member of academic staff in the School of Medicine.

2.1.2 A copy of the schedule for the meetings held on 22 October and 19 November 2009 is appended to this report (Appendix 2). The schedule shows the individual names and designations of those people whom the Panel met. The meeting on 15 December 2009 was convened to agree a final draft of the report.

2.1.3 The Panel considered in detail the evidence it received where this was directly relevant to its revised terms of reference. In some instances, the evidence referred to matters preceding the events that gave rise to this investigation (some pre-dated the merger between the University of Wales College of Medicine and Cardiff University in 2004) or strictly fell outside the terms of reference. Nevertheless, the Panel did consider many of these matters to be both illustrative of the general culture in which assessment had been undertaken in the School of Medicine and consistent with other material which had been collected over the course of the investigation. The Panel therefore sought clarification from the School of Medicine on the matter of its assessment culture. The Panel is confident that the recommendations contained within this report (see section 5 below) fully address the concerns to which this wider evidence gave rise.

2.1.4 A full list of all the documentation received over the course of the investigation is appended (Appendix 3).

2.2 VALIDATION OF DATA

2.2.1 As detailed above, the scope of the investigation was broadened following contact made by the GMC regarding reports that it had received of possible further data errors. The sequence of events on this was:

- On 9 October 2009 the Head of Quality Assurance (Education) at the GMC contacted the Vice-Chancellor. This communication reported one further data issue that the GMC

had received; the Investigation Panel's secretary followed up this report directly with its Head of Quality Assurance.

- On 21 October 2009, the day before the first session of the Investigation Panel was held, the Head of Quality Assurance (Education) confirmed to the Panel's secretary that the GMC had received reports of four further data errors. The provenance of these reports is unknown, but as the Panel did not consider this to be a relevant matter, it proceeded to include them in its investigation. The GMC was already aware of the data error that had been made on the EMQ paper and the change of results for the 5 students as detailed at 1.1.1 above. The four further data errors now being reported by the GMC were in addition to the data error on the EMQ paper.

2.2.2 The GMC confirmed that four of the five reported errors appeared to have occurred in the 2008/2009 academic year and were:

i) Year 4 2009. Written paper: Knowledge and Understanding – an undated communication on School headed paper (addressee details obscured) from the Dean of Medicine was provided.

ii) Year 2 Academic Skills Panel: incorrect mark – a communication from the Dean of Medicine dated 8 October 2009 (no addressee details shown) was provided.

iii) Year 3 OSCE Examinations (no documentary evidence provided) – the GMC letter notes: "A number of students were advised they had passed when in actual fact they had failed. …. When this came to light the re-sit date had passed. The students were advised verbally of the situation and allowed to proceed into Year 4 following a period of additional training".

iv) In relation to the EMQ paper, the GMC reported that it had been communicated to them that, "approximately 70 graduates now doctors are unaware of their correct marks".

The GMC also reported on a possible error for Year 4 2007 – a statement from Roger W Marshall, formerly Reader and Medical Sub-Dean (Assessment) was provided.

2.2.3 As noted above (paragraph 1.3) the GMC asked for the terms of reference to be reviewed in light of these reports. The GMC also asked that the University confirm the number and nature of errors identified by the School of Medicine (including 2007 and any other years if known). At its first meeting the Investigation Panel agreed upon:

i) the range of data validation that the School of Medicine was required to undertake in order to ensure, as far as was reasonable, that all possible data errors had been identified; and

ii) the documentary evidence required from the School of Medicine in relation to:
- the data errors raised by the GMC;
- any further data errors already known to have occurred; and
- any further data errors that were identified through the process of data validation.

2.3 CONFIRMATION OF VALIDATION UNDERTAKEN FOR INVESTIGATION

2.3.1 The specific coverage of the validation for the investigation as confirmed to the School of Medicine was:

i) Conduct a comprehensive validation of all assessment results for year 3, 4 and 5 students for session 2008/2009: this validation to:
- check the transposition from raw data into the spreadsheet which was used by Examining Boards for the confirmation of results;
- be undertaken across all students in the cohort;
- validate the formulae used in the spreadsheets for all year 3, 4 and 5 results;
- provide a detailed account of the validation undertaken in relation to all of the above; and
- provide a further detailed account should any further data errors be identified: to include:
  - the name and type of the exam/assessment;
  - the date of the exam/assessment;
  - the nature of the error;
  - the year group and numbers of students affected and the impact of the error on them; and
  - the School's response on any action required to prevent any further such occurrence.

ii) Provide a detailed account on all of the errors cited by the GMC: this account to detail:
- the name and type of the exam/assessment;
- the date of the exam/assessment;
- the nature of the error;
- what event led to the identification of the error (e.g. student appeal);
- the year group and numbers of students affected and the impact of the error on them; and
- the School's response on any action required to prevent any further such occurrence.

iii) Provide a detailed account on any other exam mark errors which the School knows to have occurred over the last 5 years, additional to those already cited by the GMC: this to include:

- the name and type of the exam/assessment;
- the date of the exam/assessment;
- the nature of the error;
- the year group and numbers of students affected and the impact of the error on them; and
- the School's response on any action required to prevent any further occurrence.

iv) Conduct a comprehensive validation of all examination/assessment results on a longitudinal basis across years 1-5 for the student cohort graduating in session 2008/2009: this validation to:

- check the transposition from raw data into the spreadsheet which was used by Examining Boards for confirmation of results;
- be undertaken across all students in the cohort;
- validate the formulae used in the spreadsheets for all year 3, 4 and 5 results;
- provide a detailed account of the validation undertaken in relation to all of the above; and
- provide a further detailed account should any further data errors be identified: to include:
  - the name and type of the exam/assessment;
  - the date of the exam/assessment;
  - the nature of the error;
  - the year group and numbers of students affected and the impact of the error on them; and
  - the School's response on any action required to prevent any further such occurrence.

2.3.2 A preliminary report from the School of Medicine on the data errors raised by the General Medical Council was submitted to the GMC on 30 October 2009. The timescales for the completion of the validation meant that the outputs from i), ii) and iii) were available at the Investigation Panel's second meeting. At this meeting the Panel closely examined the School's statement with those members of staff who had undertaken the validation and prepared the report, to ensure that the reasons for the data errors were fully established and understood. Following this examination the Panel asked the School of Medicine to provide further information and clarification on some matters of detail. This information, coupled with the report arising from the validation completed under 2.3.1 iv) above, was subsequently circulated to all members of the Panel.

2.3.3 The full statement arising from the validation undertaken by the School of Medicine is appended to the report at Appendix 4.

3. MBBCh PROGRAMME CONTENT AND DOCUMENTATION

3.1 PROGRAMME DOCUMENTATION

3.1.1 As background information the Investigation Panel was supplied with a range of documentation on the content of the MBBCh and the regulations under which it is administered. This included:

- Student Handbooks;
- Schedules of Assessment;
- Award rules;
- Procedures re standard setting.

The Panel did not consider that a detailed consideration of this documentation was within the scope of its investigation. The Panel was however encouraged that the School is currently conducting an extensive review of all of its assessment practices. The School had commissioned this review prior to the identification of the data errors that are the subject of this investigation primarily to address its compliance with the recommendations for assessment practice that are contained in the GMC document, "Tomorrow's Doctors". The review is addressing:

i) the School's assessment and feedback processes: responding to outcomes from the National Student Survey (NSS);
ii) co-aligning Biosciences assessments (Years 1 and 2) with the clinical years (Years 3-5);
iii) ensuring a clear progression of competencies for medical students across the years of study;
iv) ensuring that qualifying doctors are fit to practise as Foundation Year 1 doctors; and
v) identification and consolidation/standardisation of quality assurance processes in assessment, such as standard setting, blueprinting and double-marking.

Following the identification of the data errors the review was extended to cover the processes by which marks are handled.

3.1.2 The review will involve a detailed consideration of much of the documentation that has been presented to the Panel. An early conclusion is that the Schedules of Assessment for each year need to be standardised and a student's progression and learning through the years to Foundation Year 1 (FY1) should be explicitly stated. The School is currently working closely with Registry to update, clarify and present information consistently in the Schedules of Assessment. The Investigation Panel is pleased to

see these working linkages with Registry and encourages the School to continue to make full use of such support and guidance.

3.1.3 The written evidence that the Panel received from a member of the academic staff in the School (see 2.1.1 vii above) commented that the undergraduate Schedules of Assessment are overly complex. This comment was reinforced by the report that the Sub Dean for Assessment presented to the Panel: this showed that a number of external examiners had also remarked on their complexity. The Panel did not regard this specific point as being within the scope of its investigation, but was encouraged by the School's attention to it as part of the general review of its assessment practices.

3.2 USE OF VIVAS

3.2.1 The Panel initially understood that the investigation would be asked to address the use of vivas in the School of Medicine. The context to this was that despite the reference in the Year Handbook circulated to year 5 students in 2008/2009 that, 'At the discretion of the Examining Board students may be required to attend a viva', the Reconvened Examining Board held on 14 August 2009 had confirmed that, 'vivas have not been used by the Examining Board for a number of years and that to do so in this instance would constitute a major departure from current practice'. The question of their use was subsequently clarified through the appeals process for the four candidates whose awards were rescinded; consequently the Investigation Panel was not required to take any action on the matter. As a result of the appeals process the School of Medicine confirmed that:

i) the School had ceased the use of vivas at the Pass/Fail boundary some time ago following a lengthy consideration and engagement with its external examiners and the GMC;

ii) that this cessation had been supported by the GMC: in the QABME: the School of Medicine, University of Wales report for 2005/2006, the GMC had stated, 'The team supported the Cardiff School's decision to discontinue pass/fail vivas as part of the Final Examination, as from the next academic year. The team concluded that the School is using valid and reliable methods to assess'.

3.2.2 The Awards and Progress Committee (28 October 2009) has advised the School that reference to Pass/Fail vivas as part of the Final Examination should be removed from all documentation and that its removal should be communicated to students.

3.3 CLASSIFICATION OF AWARDS

3.3.1 The Investigation Panel was aware that at its meeting on 23 September 2009 the Awards and Progress Committee had noted, 'that it would appear that minor changes to marks for units of study could lead to a significant change in degree classification and that consequently it would be appropriate for the criteria for the determination of degree classification to be reviewed.'

3.3.2 Following these observations the School agreed to review its award rules to ensure that they provide sufficient and appropriate delineation between students, and can be clearly understood by them. As the School had already confirmed its review on this matter the Investigation Panel did not pursue it further. However, as part of this review, the Panel's **ADVICE** is that the School may wish to consider whether it is more appropriate to adopt award rules that are criteria based.

3.4 INPUT FROM STUDENTS

3.4.1 The students confirmed that they were clear as to the learning outcomes for individual components within the MBBCh and that they generally found that there was consistency between them and the content of assessments. Programme Handbooks are issued to all students at the start of each academic year (The Panel saw copies of these; see the list of documentation at Appendix 3). The students confirmed that the Handbooks outlined the programme coverage for the year but thought that they would be more helpful if they contained information on such matters as assessment deadlines and feedback arrangements. The students considered that the absence of such key information was symptomatic of a broader concern about effective communication between the School and its students; this is covered in more detail below at Section 4.5.

3.4.2 There are two academic representatives from each of the years of the MBBCh. The School's Curriculum Management Sub-Group, which comprises members of the academic staff, meets the student representatives on a monthly basis, when the Sub-Group is reconstituted as the Staff Student Panel. The minutes from these meetings are posted on the web and can be accessed by all students.

4. ASSESSMENT PROCESSING IN THE SCHOOL OF MEDICINE

4.1 CONDUCT OF DATA PROCESSING IN SCHOOL OF MEDICINE

4.1.1 Over the course of the two evidence gathering sessions the Panel explored the full sequence of activities associated with the processing of assessment data for the MBBCh, from the point at which an assessment was completed by a student to the final

confirmation of results at the Examining Board and consequent confirmation of outcomes to students.

4.1.2 The School currently does not have a database for student records but has used Excel spreadsheets for the formal recording and manipulation of assessment data to be confirmed by Examining Boards. Like any School, confirmed results are subsequently uploaded electronically to the University's central student record system (SIMS) and Registry undertakes the formal notification of results to students via individual correspondence. Pass lists for year 3-5 students are published within the School. The purpose is to ensure that students are advised of their results as soon as possible following the completion of an Examining Board; it is not unusual for the School to seek to publish a pass list on the same day as the Examining Board.

4.1.3 Until this academic session the School of Medicine's standard practice has been to issue its own candidate numbers to all students on the MBBCh: this practice included the issue of new 5-digit candidate numbers to students as they started each year of the programme. This candidate number, which is used for the purpose of assessment, is in addition to the University student number that Registry issues separately to all students. This 7 digit University student number is used over the entirety of the programme and all data for the student is recorded against it (including assessment results) on the central student information management system (SIMS). The School's practice of using separate candidate numbers had operated for some years, predating the merger between the University of Wales College of Medicine and Cardiff University in 2004. The Panel could not establish the original justification for the practice with the personnel seen, as none had been in post at the time when it was first introduced. However, the Panel understands that the School had continued the use of its 5-digit student number because it considered the University student number to be unsuited to its needs. The University number was thought to be too long (at a previous point it had been 9 digits), inconsistently created, and therefore unreliable as the basis for sorting students. The School's numbering system was based on a standardised sort of the students using their surnames and first names as derived from central student records. The issue of different candidate numbers each session also meant that the system could be used to denote the year of the student.

4.1.4 The candidate number has been used across all clinical and written assessments undertaken on the MBBCh. In the case of EMQ the marking sheets used in the written examination in 2009 were individualised to the student, showing their student name and barcode (this being the SIMS student number); students were required to insert their own candidate number onto the sheet.

This assessment requires students to select the correct answer from a series of possible answers by shading in a '0' adjacent to their selection. The completed question paper is then machine-read. For the Objective Structured Clinical Assessment (OSCE) assessments, individual scoring sheets for students were held at each of the stations and the marks were also entered by the examiners onto the machine-readable matrix.

4.1.5 Scanning is used extensively in the School of Medicine for data processing and for the machine reading of student- completed scripts and assessor mark sheets. At the end of all assessments the completed mark sheets are collected and manually checked to ensure that all sheets were present and complete: they were then sorted into script number order prior to machine reading. The School uses Remark scanning software mounted on Canon scanners. A new version of the scanning software, Remark 7, was being used in session 2008/2009. This part of the process is managed by the relevant Year Co-ordinator, a member of the administrative team working with other staff in the Undergraduate School Office. For logistical reasons regarding space and storage, the scanning was undertaken at some distance from the Undergraduate School Office. There is a 'checklist' for the scanners to follow if any anomalies are flagged during the scanning process: these include checking for blanks, duplicates, selection of multiple choices and any disparity in candidate numbers. An example cited was that the scanner would identify whether two students had used the same candidate number, which could then be verified manually in the School.

4.1.6 The scanned output for each assessment is saved in a tab-delimited ASCII format and the data saved securely on a shared drive in the School. This ASCII format is set out in rows, each row signifying an individual student, with overall marks for the assessment being shown at the end of the row. These raw data are then compiled into the Excel spreadsheet. A new spreadsheet of marks is created each academic session. This includes the import of student data and the copying and pasting of formulae from previous sessions (when at this point students would have a different candidate number). The formulae used reflect the weighting of the assessment component and the standard setting being applied. The Excel spreadsheet records the candidate number and the University student number.

4.1.7 This export of raw data into the Excel spreadsheet was undertaken by the Data Manager and spreadsheets were then produced. These spreadsheets are provided to the Academic Directors for validation ahead of the meeting of the Examination Executive. The validation at this point would include checking that the formulae were working correctly for the standard setting and the weighting assigned to the assessment. A judgement on

the veracity of the standard setting would be undertaken with appropriate adjustment being made at this point in light of student outcomes.

4.1.8 The spreadsheets are presented to the Examining Boards for confirmation of student awards/progression. The Examining Boards are not provided with the raw data.

4.2 MANAGEMENT OF ASSESSMENT PROCESSING

4.2.1 Assessment processing is delivered via a matrix management method, with differing levels of direct involvement from a wide range of administrative, management and academic staff. This includes:

i) Academic year co-ordinators and administrative staff: based in the Undergraduate School Office these staff are line managed by the Undergraduate Operations Manager, but they also have direct links through their work with the Academic Year Directors (3 in post).
ii) Undergraduate Operations Manager: the postholder has overall responsibility for managing the Undergraduate School Office and reports directly to the School Manager. The postholder also has direct links to the Sub-Dean for Assessments and the Dean of Undergraduate Studies.
iii) Data Manager: directly managed by the School IT Manager who in turn reports to the School Manager.
iv) Sub-Dean for Assessments: an academic post reporting to the Dean of Medicine via the Dean of Undergraduate Studies.
v) Academic Directors for Years 3, 4 and 5: these academic appointments report to the Dean of Medicine via the Dean of Undergraduate Studies.
vi) Dean of Undergraduate Studies: reports directly to the Dean of Medicine.

4.2.2 The matrix operates on the basis of defined line management and reporting lines and also direct linkages between administrative and academic staff. These linkages are defined by the School as 'including directing activity and providing advice/guidance, but falling short of full line management.'

4.2.3 Responsibility for the compilation and academic oversight of assessments rests with the Examination Executive for each year of the course, chaired by the Year Academic Director.

4.3 REASONS FOR DATA ERROR ON EMQ PAPER

4.3.1 In its communication with the GMC dated 7 September 2009, the School had provided an explanation in lay terms of the errors that had been made on the EMQ paper. "The error was not in the marking itself but in the transfer of marks to a spreadsheet. The

error occurred in the transcription of the data set relating to the EMQ paper. Scripts are machine marked (scanned) following the examination and a file of the 'raw' data is then exported into an Excel spreadsheet where it is adjusted to reflect the Standard Set pass mark for the paper. The spreadsheet also adjusts the mark to reflect the weighting attached to the paper within the overall module. On this occasion a processing error in the transfer of the data from the scanning software into the spreadsheet lead to marks for this component being allocated to the wrong students. This meant that the final Examining Board held on 24 June 2009 had confirmed results for students on the basis of incorrect data".

4.3.2 In exploring this further, the Investigation Panel established that the School believed that the error occurred as a result of a member of staff cutting and pasting a block of data from the ASCII file into the Excel spreadsheet, *but who had not recognised the potential for a discrepancy in the sort order between the raw data and the Excel spreadsheet*. This meant that the results for 137 students were transposed incorrectly from the raw data into the Excel spreadsheet. This disjunction of the data, and therefore the fact that the student marks on the raw data did not correspond with the data showing against the same student names on the spreadsheet was not detected prior to submission of the data to the Final MB Examining Board on 24 June 2009.

4.3.3 On the basis of the evidence available to the Investigation Panel, it is clear that the data errors on EMQ were directly caused by one member of staff's mis-transposition of the raw data into the EXCEL spreadsheet. The Panel has not been able to discuss this in detail with the postholder as the member of staff is not currently available. However, the Panel noted that in her written report the Sub Dean for Assessment confirmed that on taking up the post in July 2009, she had worked directly with the postholder in performing the FY1 ranking for Year 4 students. She confirmed that the postholder had complained about the receipt of data that was not 'clean', and which contained duplicate or missing candidate numbers.

4.3.4 The Panel reached the early conclusion that the EMQ data error was caused by this mis-transposition of data. But we were concerned to establish with the School how this serious human error (and potentially others) had not been detected at an early stage and prior to the data being presented to the Examining Board. The Investigation Panel established that:

i) there were no documented procedures defining the methodology to be used in the transposition of data; the member of staff in question who had carried out the transposition in the previous session was at that point closely supervised by the Sub-Dean for Assessment, who had since retired;

ii) at the time when data was being transposed in June 2009, there was no Sub-Dean for Assessment in post: following an earlier unsuccessful attempt to fill the post it was re-advertised in April 2009 and the current postholder started on 1 July 2009;

iii) the School had made no arrangements to cover the duties carried out the Sub-Dean for Assessment during this interim period and therefore had not replicated the very close control and direction provided by the previous Sub-Dean for Assessment;

iv) that following the retirement of the previous Sub-Dean for Assessment there had been a considerable loss of expert knowledge and experience in relation to assessment processing; the succession planning process had not included any systematic documentation of the data processing procedures by which he had operated;

v) there were deficiencies in the scanning process which were leading to gaps in data, duplicates, etc not being resolved prior to the transposition of data;

vi) the transposition of data that had been confirmed by the Final MB Examining Board had been carried out by one member of staff with no active supervision;

vii) there were no documented protocols specifying any checking procedures to be undertaken following the transposition of data;

viii) nobody in the School had undertaken any checking of the work undertaken by the person who transposed the data: the validation undertaken by the Academic Directors on production of the spreadsheet had been solely against the application of the formulae for standard setting and had erroneously assumed that the student data shown on the spreadsheet was accurate;

ix) that the timescales for the whole data handling and confirmation processes were very tight and were strictly constrained by the dates for Examining Boards and by the deadlines set by the University for the confirmation of results (these deadlines being set around other key University wide activities including resit examinations and the preparations for graduation ceremonies in July): in this timeframe there were a significant number of assessment related activities taking place simultaneously, which meant that activities such as the organisation and conduct of the OSCE assessment were running alongside the processing of results from the written assessments;

x) the Undergraduate Operations Manager had been absent from December 2008 to September 2009: the post had not been covered during this period leaving the School Manager to maintain an overview of the assessments process during this period.

4.4 OUTPUT FROM VALIDATION OF DATA

4.4.1 As a result of the validation carried out by the School of Medicine (see Appendix 4), it was established that:

i) all of the data errors that took place in 2008/2009 had arisen during the compilation of assessment data onto the spreadsheets;

ii) that the GMC had been misinformed on the error reported on the Year 3 OSCE Examinations (see 2.2.2 iii) above);

iii) in addition to the errors reported by the GMC, there was one further error that had taken place in 2008/2009 on the Year 4 OSCE examination data in Child Health. The full details of this are shown at paragraph 20 of Appendix 4.

iv) the error on the Year 4 Marks 2006/2007 had arisen in the compilation of data in respect of one element of the Attitude and Conduct marks: it had not been identified until after confirmation of results following an upgrade to the spreadsheet system; data that had been previously been read correctly as numeric data in earlier versions were now erroneously being treated as non-numeric data. A full explanation of this is given at paragraph 19, Appendix 4;

v) no further errors had been identified through the longitudinal validation of data for the student cohort completing in session 2008/2009.

4.4.2 As a result of the validation undertaken for this investigation and via the further evidence collected over the course of the two evidence sessions, the Panel **CONCLUDED** that:

i) it had fully established the reasons for the data errors and consequently, in accordance with its terms of reference, the Panel was in a position to recommend actions to address weaknesses within current School practices;

ii) the full extent of any data errors had been established;

iii) as the longitudinal validation of data had not established any further data errors, no further validation would be instigated under the terms of this investigation.

4.5 STUDENT INPUT

4.5.1 In its meeting with the student representatives the Panel explored their experience of the assessment processes on the MBBCh. They referred to what they described as a "catalogue of errors" that they or those they represented had experienced over a period of time in relation to their assessment. These errors were not isolated instances but spanned the full duration of the MBBCh and had included problems while students were based in the early part of the programme in the School of Biosciences. They drew the Panel's attention to a report that the Medical Students Society (MedSoc) had written in October 2007 entitled, "Assessment and

Examinations Report", which was copied to us after the meeting. Taken together the students' oral and written evidence revealed a number of problems:

i) students receiving somebody else's results: this happened where names were the same or very similar e.g. Davies and Jones were very common surnames on cohorts;
ii) the issue of incomplete results/transcripts and subsequent delays in obtained accurate confirmation;
iii) spelling/grammatical errors/incomplete questions on written assessments;
iv) one instance where an assessment paper had had the answers included in it with the result that the examination had to be cancelled.

4.5.2 The students had presented their MedSoc report to the monthly meeting when the Curriculum Sub Group functioned as the Staff Student Panel. Whilst acknowledging that there had been some improvements, the students did not feel that these had been sustained, as similar problems occurred subsequently. The Panel notes that the students did not at the time receive any formal response to their report.

4.5.3 Whilst recognising that some of these instances of errors/problem cited by the students fell outside the terms of this investigation, the Panel was very concerned to note the students' strongly expressed anxiety regarding the overall management of the MBBCh:

i) a feeling of constant confusion regarding operational arrangements for assessments: this included a lack of clarity about deadlines for submission of assessed work and the receipt of marks and feedback;
ii) a continuing sense of confrontation and battle with the School;
iii) spasmodic and incomplete information flows to students;
iv) ongoing efforts to hunt for essential information about assessments which should have been freely available;
v) concern that following their graduation the School might contact them to say that there had been an error with their assessments and that they had in fact failed.

4.5.4 More generally the students were concerned that the history and publicity surrounding the 2008/2009 data errors could call into question the credibility of their Cardiff degrees and their standing as medical practitioners.

4.5.5 When asked to what they attributed these problems the students felt that lack of communication from the School was a key obstacle. It was their perception that there was insufficient academic and administrative resource to support the MBBCh. The academic support in particular appeared to be vested in a small

number of staff who were very helpful when contacted, but who were invariably carrying out more than one substantive role on the MBBCh in addition to their own academic/clinical responsibilities.

4.6 CONCLUSIONS REGARDING DATA PROCESSING IN THE SCHOOL OF MEDICINE

4.6.1 It is clear that the specific data errors that have been identified in relation to 2008/2009 data processing were caused directly by manual deficiencies in the data handling processes and in the manipulation from raw data into the Excel spreadsheets. On the face of it these errors are simple in nature, but their impact has been traumatic for the students concerned and potentially highly damaging for the reputation of the School of Medicine and of the University. Moreover, the occurrence of such errors and the fact that they were not identified within the School's management structures prior to the holding of the Examining Boards, illustrates a more fundamental and systemic failure in the management of its assessments and of the data generated from them. The Panel was clear that the shortcomings in the School's governance over these key matters, that were revealed by this and other past episodes to which its attention was drawn are serious, of a significant scale, and require urgent corrective action.

4.6.2 Whilst concluding that there have been serious failings in the governance and management of data processing within the School, the Panel wish to make it clear that none of the concerns or issues that have been raised during the process of investigation have cast any doubt as to the academic standards of the MBBCh. This conclusion is substantiated by the School's External Examiner reports, which have raised no issues of principle concerning its academic standards or the comparability of the MBBCh award with that of other institutions in the sector.

4.6.3 As detailed above (see 3.1.1) the School of Medicine is currently conducting a detailed review of assessment. The review is ongoing, but it is reassuring that early material from the process (as reported by the Sub Dean for Assessment) shows that the School has correctly self-diagnosed the systemic issues that need to be addressed.

4.6.4 The Investigation Panel has **CONCLUDED** that the following constitute **a serious risk to the overall governance and management of assessment processing** in the School of Medicine:

i) From the organisational structures of the School it does not appear that there is any single person/postholder with a clearly designated responsibility and authority which spans the entirety of the assessment management process. This failure is compounded by the fact that the line

management arrangements for the staff are not common across the assessment function. Whilst not doubting the commitment and dedication of individual members of staff, it appears that on a day-to-day basis work is being conducted by individuals with no holistic leadership or direction. Nor is any transparent method applied to ensure a common sense of purpose and understanding as to the respective responsibilities that individuals have, or as to how each of the components in the process is linked to the others, so as to assure probity in the profiles of assessment results.

ii) The lack of a robust database in the School for recording assessment data.

iii) The lack of a clear and articulated understanding of the roles and responsibilities that key personnel have in the administrative process of handling marks.

iv) The lack of understanding of the process itself on the part of the senior managers who were managing the administrative staff.

v) Inappropriate assumptions as to the veracity of data being received by Examining Boards.

vi) Insufficient checking of data at all stages of the process coupled with the absence of any protocols that set out clearly either the validation or the auditing to be undertaken prior to the presentation of full and complete data to an Examining Board.

vii) The lack of any clear academic or administrative leadership or direction in the absence of the Sub Dean for Assessment and the Undergraduate Office Manager, aggravated by the inadequate arrangements that the School made to manage such absences.

4.6.5 The Investigation Panel has **CONCLUDED** that the following constitute **a serious risk to the operational delivery of assessment processing** in the School of Medicine:

i) Logistical difficulties arising from office layout and space issues: the scanning of mark sheets was taking place at some distance from the undergraduate office and there was a lack of space for scanning and storage of mark sheets.

ii) Operational shortcomings in training staff appropriately for the use of the scanning software.

iii) The lack of any defined protocols for the use of the scanning software.

iv) The use of additional School-based candidate numbers which has both added to the complexity of the operational processes and required additional effort to transpose those numbers accurately against the University's student identifier numbers.

4.6.6 The Panel did note that there had been a number of changes in academic and administrative personnel during session 2008/2009. The Panel did not consider the reasons for this relevant to its investigation, but it did note that the cumulative impact of these changes was that the School's institutional memory concerning the processing of results had been severely compromised. The Panel's view is that the School had not appropriately managed the inherent risks arising from the turnover of staff.

5. ASSURING PROBITY, RIGOUR AND ROBUSTNESS OF ASSESSMENT OUTCOMES.

5.1 EXPLANATION OF THE CONTEXT TO OUR RECOMMENDATIONS

5.1.1 Over the course of the investigation the Panel has collected a very substantial quantity of information from staff in the School of Medicine and from its students. The Panel has particularly valued the School's full co-operation; its frank and open approach was very helpful and greatly facilitated the Panel's work. The School of Medicine is clearly fully aware of the seriousness of the situation and of the absolute imperative for urgent action to be undertaken in time for the confirmation of results during session 2009/2010. The Panel was also very grateful for the input from the student representatives. It is clear that students are very concerned that the School's credibility has been seriously damaged and that there is a potential for these events to discredit both the award that they are working hard to achieve and their standing as medical practitioners.

5.1.2 Given that the investigation has been running concurrently to the review of assessment being carried out by the School of Medicine it is understandable that some of the discussions relating to assessment have broadened. These have helped the Panel to obtain a full understanding of the School's current position, and in some cases the School has taken the opportunity to discuss with the Panel its own preliminary conclusions as to the way forward. However, recognising the terms of reference for the investigation, the Panel has distinguished between:

i) actions that are seen as an absolute imperative to directly address the weaknesses in current School practices: in this case the Panel has made a series of **RECOMMENDATIONS**;

ii) actions which the School is undertaking as a result of its own review of assessment and which the Panel has **ENDORSED** as being consistent with the recommendations being made**;**

iii) work which will be addressed more fully through the School's own review of assessment: in some instances the Panel **OFFERS SOME ADVICE TO SUPPORT FURTHER ACTION IN THE SCHOOL OF MEDICINE**: this advice is based on evidence collected over the course of the investigation

and the helpful input from Professor Mathieson on comparable deliberations about the timing of assessments being undertaken at Bristol University.

5.2 RECOMMENDATIONS FOR URGENT ACTION

5.2.1 The Panel **RECOMMENDS THAT** the following actions are required to address the weaknesses that have directly contributed to the data errors that occurred in June 2009. **Some of them require immediate action. The Panel stresses to both the School of Medicine and to the University that without such actions being undertaken and their actual or likely effectiveness promptly ascertained and revised as appropriate, the confirmation of assessment outcomes during 2009/2010 will be running at serious risk.**

R1 The School should clearly designate a single postholder to have overall authority and responsibility for the governance and management of assessment data. This is essential to ensure a holistic, joined-up approach across the totality of the data processing activities being carried out in the School. From the organisational structures seen during the investigation, the Panel was unclear as to whether such an overall responsibility would fall to an existing postholder or would be part of the responsibilities for the new post of Director of Medical Education. Recruitment to this newly established post is currently taking place

R2 Following on from R1 above, all other personnel contributing to the delivery and processing of assessments in the School of Medicine should have their own roles and responsibilities explicitly defined. Whilst recognising that organisational structures rest with the School, the Panel is concerned that the current matrix management method is compromising clear lines of authority within the assessment process. The Panel **RECOMMENDS** that this is given particular attention if the School proceeds as desired with the appointment of an Assessment Data Manager, so as to ensure that there are clear reporting lines between this post and the Undergraduate Operations Manager.

R3 The School should instigate team building activities across all personnel involved in the delivery and processing of assessments in the School: a key objective should be to ensure that personnel understand the 'bigger picture' and their own vital contribution in ensuring the rigour and probity of operational activities.

R4 Data management protocols must be documented and should detail:

(i) the procedures for ensuring the collation of a complete data set of assessment marks for all students;

(ii) all stages associated with the processing of data from its initial arrival in the Undergraduate School Office through to the publication of results and feedback to students.

These protocols should clearly identify timelines for the completion of these various tasks, together with clear specification of relevant roles and responsibilities within the School. The protocols should include a fully populated flow diagram that clearly shows all of the stages in the process. Staff training should be conducted on a regular basis against these protocols; recognising that there may be a natural turnover of staff or that staff will need to re-familiarise themselves with operational protocols prior to times of peak usage during the annual cycle

R5 Systems for verifying and checking data at all stages of the process should be specified. This specification should include confirmation of the means by which the School will audit the systems. Individual responsibilities for conducting such verification and auditing should be explicit and confirmed to the relevant postholders.

R6 The School must confirm to the University the means by which it will hold and manipulate assessment data for the session 2009/2010. It has identified the need to develop a new single database to support the management of the Examining Board processes for all years of the MBBCh. The School regards this as the workable option for the short to medium term, but in the longer term is committed to using the University's Student Information Management System for the management of its student data. Work is currently ongoing to produce a detailed and agreed specification for the new database. To ensure that the specification is complete and to ensure that there are no subsequent changes necessary, the School will need to detail the development environment and database structure, document all processes and control mechanisms, specify methods of assessment and format of transcript, format progression and award rules. It will also need to ensure that the new database can extract data from and upload data to the University's Student information Management System. The specification should identify any data for current students that will need to be migrated from other sources into the new database, the progress for such migration to be undertaken and for data to be verified. The School will need to work closely with Registry and Information Services in specifying and setting up the database.

R7 The School must establish clear protocols for data integrity in relation to the operation of the database: as a matter of principle this should include restricting access to change data to a small number of defined personnel.

R8 The School must ensure that it develops its expertise in the use of the scanning software. This will include exploring the full functionality of Remark 7 and establishing whether this is the best software for these purposes.

R9 The School of Medicine must cease the use of its own candidate numbers for students and use instead the University number as the unique identifier for each student. The Panel was concerned that there is no University consensus on this issue and that the School of Biosciences apparently wishes to retain the use of its own candidate numbers for MBBCh students. The University must take a view on whether a consistent approach on this matter would not be preferable, recognising that inconsistent approaches carry both the potential and, in this case, actual risk of error. The Panel was left in no doubt that had a single student number been used, the School would have been able to identify the data errors more readily.

R10 The School should set aside secure and adequate space in which to undertake effective data management

R11 All communications issued to students, and particularly those relating to assessment matters, must be accurate and complete. This should cover the whole MBBCh programme, including both the School of Biosciences and the School of Medicine. The Panel further **RECOMMENDS** that the University consider whether it would be desirable in the interests of the students' experience to bring about a much closer alignment between the two Schools.

5.3 ENDORSED ACTIONS

5.3.1 The Panel is aware of a range of further actions that are being instigated by the School of Medicine as a result of their current review of assessment. The Panel **ENDORSES** the following School actions as they are consistent with the recommendations set out in paragraph 5.2.1.

E1 The appointment of a dedicated Assessment Data Manager who has particular skills in using databases and a sound understanding of the assessment process. It is intended that the Undergraduate Operations Manager will be seconded to this post in the first instance, given her knowledge and understanding of this area.

E2 The establishment of a dedicated space in the Undergraduate Office for data scanning and the planned co-location of the Sub-Dean for Assessment and the new Assessment Data Manager. The Mark sheets will now be stored in student –labelled files, to enable easy access for checking and verification of marks

E3 Bringing forward the Final MB written papers from June to early May 2010. This will ensure that the School has more

time for the processing of results from these written papers, which work will not run alongside the organisation of the OSCE assessment. When the Panel met the student representatives the School had not finalised these arrangements, pending endorsement by the Panel. The students were very clear that they wanted the timing of the Final MB written examinations to be confirmed as a matter of urgency. The Dean of Medicine had advised them at the beginning of the 5th year in October 2009 that the timing might be changed, but when the Panel saw them the students were waiting on confirmation of this. The students indicated that, in their opinion, bringing forward the written examinations to early May would prove viable and would be generally welcomed: it was not felt that it would adversely affect the existing clinical and academic content of the programme. A change to the timing would require moving the clinical consolidation component so that it fell after the written examinations and before the OSCE. The students felt that there were benefits in the proximity of the clinical consolidation to the OSCE. Recognising the need for the School to confirm its decision on the timing of Final MB examinations, the Chair of the Investigation Panel wrote to the Dean of Medicine immediately after the second session, endorsing the School's proposal to bring the Final MB written papers forward. The Panel is pleased to note that the School subsequently confirmed to final year students that Final MB written examinations will be held in early May 2010.

5.4 MANAGING THE RECOMMENDATIONS AND ALIGNED ACTIONS

The scale of work required is considerable and will involve significant staff effort, commitment and dedication to ensure that these actions are successfully implemented. The Panel's **RECOMMENDATION is that it is essential that**:

R12 these actions are planned and managed through a project management framework, with clear lines of communication, accountability, reporting and risk management: operating by such a project framework will require timescales to be defined, against which progress can be measured

R13 both the School of Medicine and the University undertake regular and close monitoring of delivery against the agreed framework; the means by which such monitoring will take place should be clarified, but at a minimum the University must be assured before the Examination period commences that the School has implemented all those actions that have been identified above and that it is as a consequence confident of the integrity of its assessment processes for 2009/2010

R14 the resources necessary for the delivery of the actions set out in paragraphs 5.2 and 5.3 above are identified and allocated.

5.5 REVIEW OF ASSESSMENT – ADVICE FROM PANEL

5.5.1 The submission made to the Panel by a member of academic staff from the School of Medicine had raised concerns regarding double marking, Special Study Components and academic input from University and NHS Trust clinicians (see 2.1.1 vii above). We note that these matters are specifically being addressed in the School's review of assessment.

5.5.2 Whilst concentrating predominantly on actions which will directly assure data probity, the Panel has over the course of the investigation gathered some information and evidence that it considers relevant to the School's review of assessment. Consequently the Panel **OFFERS SOME ADVICE TO SUPPORT FURTHER DECISION MAKING IN THE SCHOOL OF MEDICINE.** This is set out below.

5.5.3 The Panel is concerned that the School's arrangements for communication with its students are less than optimal. As they currently stand they may be perceived as having a detrimental impact on the overall student experience. This has the potential to seriously damage the constructive relationship that the School and its students clearly desire. The students we saw were very positive about the meetings that had been held at the beginning of the 2009/2010 session with all year groups. The Dean of Medicine's contribution to these meetings had been particularly valued and was felt to be an example of good, open communication.

5.5.4 The School of Medicine is known to be developing a communication strategy for students. This will include the review of existing Schedules of Assessment to provide clear and standardised information on the nature and types of assessment together with an explanation of their contribution to the progression of competencies across all years of study. The School is also developing systems to ensure timely and comprehensive feedback to students following assessment. In her report to the Panel, the Clinical Sub Dean for Assessment has advocated the appointment of a psychometrician. This would be a new post in the School who would work on the development of good feedback system to students, the monitoring of examiner performance as well as quality assurance of assessments (performance of questions, reliability coefficients and development and maintenance of an item question bank). The School needs to make a decision on the resourcing of this new post.

5.5.5 The Investigation Panel is aware that the School has been involving students in the current review of its assessment processes. We were pleased to hear from the student representatives that they felt that their experience as academic representatives, had given them each an individual insight into the School's strenuous efforts to improve matters. The Panel considers that there would be a marked benefit in the School's relations with its students if it were to make such engagement a routine feature of its regulatory activities.

5.5.6 The Panel **ADVISES** that the School of Medicine:

i) engages and communicates fully with its students during both the process of review and the implementation of change, encouraging their contribution where appropriate;
ii) takes account of the contents of the MedSoc report of 2007 to ensure that all matters of concern are being addressed;
iii) continues to seek advice and guidance from students on the clarity and completeness of its programme documentation.

5.5.7 The Panel was made aware that within its current review of assessment the School is considering a radical reconfiguration of the structures for years 4 and 5. This would include:

i) changing the timing of examinations in years 4 and 5 to allow for the introduction of resits for written papers within the same academic year; and
ii) re-structuring the Final MB timetable so that students complete Finals in February of the final year; this would be achieved by moving the elective from the start of the fifth year to immediately follow the completion of Finals.

The Panel was clear that decisions on such changes rested with the School, but did not see them as being required as a direct and immediate response to the data problems that had occurred in 2009. The rationale for change should be based on sound academic and pedagogical reasons. We were aware that other institutions have adopted similar approaches. The Panel **ADVISES** that all such changes must be carefully planned with an adequate time being allowed for a full reflection on the implications for the delivery of the curriculum and for the associated regulatory changes, which will require approval at a University level. The Panel also **ADVISES** that the School discusses its plans with the students and that it phases change so as to give them appropriate advance notice. During the Panel's meetings with them, School staff made it clear that the earliest that the School would envisage any such significant re-structuring taking place would be in session 2011/2012 (i.e. for existing 3rd year students).

ATTACHMENTS

Appendix 1: Terms of Reference

Appendix 2: Schedule for the sessions of the Investigation Panel held on 22 October and 19 November 2009
Appendix 3: List of Documentation
Appendix 4 Validation report from School of Medicine.

Appendix 1

MEDIC INVESTIGATION PANEL – TERMS OF REFERENCE AND MEMBERSHIP

Terms of Reference

In order that the University Awards and Progress Committee, the University and the General Medical Council (GMC) can have the necessary confidence and reassurance in the assessment processes which inform Examining Board decisions for the MBBCh and to ensure that all necessary actions are being taken to avoid any recurrence, the Vice-Chancellor as Chair of the Awards and Progress Committee has established an investigation.

In light of comments by the GMC and reports of further errors being identified, the Panel have recommended to the Vice-Chancellor that the Terms of Reference for the investigation are amended to ensure that a full review of all systems within the School of Medicine is undertaken. The revised terms of reference are to:

1. establish in accordance with an agreed timeline (see attached), the full extent of any data errors which have occurred in the confirmation of the examination/assessment results in the School of Medicine, the nature of these errors and the reasons why they were not identified at the appropriate time;

2. review the assessment and Examining Board processes for the MBBCh;

3. identify the actions required to address any weaknesses within current School practices, which when taken will assure the probity, rigour and robustness for confirming the outcomes of students assessment results;

4. ensure that there is a comprehensive and clearly defined framework for managing the actions to be undertaken, this framework to include:
   - confirming an agreed designation of priorities and the associated timeframe for delivery;
   - definition of individual and collective responsibilities as appropriate;
   - the identification of resource requirements and how they will be met;
   - any support which will be required from the University.

The investigation panel will report to the Awards and Progress Committee and recommendations on action to be undertaken will be reported to Senate. The conclusions of the investigation will also be reported to the General Medical Council and at her request, to the Minister for Health and Social Services in the Welsh Assembly Government. The GMC have been advised of the establishment of the investigation and that the University would be mindful of any observations they may have in respect of the conduct of the investigation.

The School of Medicine have been advised that no changes to Schedules of Assessment should be made until such time as the review is completed and outcomes confirmed.

Membership

Professor David Miers, Cardiff School of Law (in the Chair)
Professor Paul Dummer, School of Dentistry
Mr Gethin Lewis, lay member of Council
Professor Peter Mathieson, Dean of Medicine and Dentistry, University of Bristol
Dr Christopher Turner, Director of Registry, Governance and Students.

Secretary: Jill Bedford, Director of Registry and Academic Services
Tracey Evans, Head of Student Cases

Appendix 2

MEDIC INVESTIGATION – 22 OCTOBER 2009

LOCATION: All meetings will be held in the Large Meeting Room, Division of Medical Education, Upper Ground Floor, B-C Link Corridor, Heath Hospital.

SCHEDULE:

1.00pm **Arrival, introductions and preliminary discussion**
(lunch will be available)

2.00pm **Meeting with relevant academic and administrative staff**

- Mr Andrew Pearce, School Manager
- Miss Helen Sweetland, Acting Undergraduate Dean
- Ms Stephanie Whitfield, Year 5 Curriculum Team Leader.

Focus: fact finding on academic and operational protocols for Examining Board processing.

2.45pm **Panel meeting**

3.15pm **Meeting with relevant School staff to discuss assessment**

- Dr Kamila Hawthorne, Sub Dean for Assessment
- Mr Andrew Pearce, School Manager
- Miss Helen Sweetland, Acting Undergraduate Dean

Focus: assessment processes for MBBCh, review of processes for assessment and confirmation of awards.

4.00pm **Meeting with Professor B Paul Morgan, Dean of Medicine**

Focus: across the full terms of reference of the investigation

4.45pm **Panel meeting: review of information gathered, identification of any further information needed and confirmation of programme for 2nd session on 19 November 2009.**

(Approximate finish at 5.15pm)

Appendix 2

MEDIC INVESTIGATION – 19 NOVEMBER 2009

LOCATION: All meetings will be held in the Large Meeting Room, Division of Medical Education, Upper Ground Floor, B-C Link Corridor, Heath Hospital.

Schedule:

1.00pm **Arrival and preliminary discussion**
(lunch will be available)

1.45pm **Meeting with students from 4th and 5th years**

- Mr Thomas Evans 4th year;
- Ms Katrina Ficarota 4th year;
- Mr Sherif Khelifa 5th year;
- Mr Andrew Hamer 5th year.

2.30pm **Panel meeting**

2.45pm **Meeting with academic staff**

- Miss Helen Sweetland, Acting Undergraduate Dean;
- Mr Andy Grant, Director year 5;

Focus: assessment processes for MBBCh, review of processes for assessment and confirmation of awards

3.30 **Panel meeting**

3.45pm **Meeting with administrative/managerial staff from School Office**

- Mr Andrew Pearce, School Manager;
- Ms Sarah Wilde, UG operations manager;
- Mr Tim Cross, IT manager.

Focus: review of processes for assessment and confirmation of awards

4.30pm **Panel meeting: report conclusions and recommendations.**

(Anticipated finish at 6.00pm).

Appendix 3

LIST OF DOCUMENTATION RECEIVED OVER THE COURSE OF THE INVESTIGATION

Section A: Background Information Requested from the School of Medicine

Document Number	Document Title
	MBBCh Student Handbooks
1	▪ year 5 (2008/2009)
2	▪ year 4 (2008/2009)
3	▪ year 3 (2008/2009)
4	Generic course information, for Medical Undergraduate Taught courses – Cardiff 5 year MBBCh programme 2008/09
5	Cardiff University Medicine (MBBCh) Curriculum Guide
6	Cardiff University Medicine (MBBCh) SSC Handbook
7	GMC Tomorrows Doctor
8	Procedure for rewarding excellence at the end of each Phase of MBBCh course (for students on MB course, except year 5 2008/09)
9	Procedure for rewarding excellence during MBBCh course (Distinctions & Merits at Final MB)
10	Panel Convenor Assessment Booklet 2008-09
11	Medic Operational Work Schedule of Assessments
12	Standard setting for EMQ short answer and Data Interpretation Assessments.
13	Final MB (Phase 3): Schedule of Assessment 2007 - 2009 (parts II, III & IV)
14	Final MB (Phase 3 part 1) Schedule of Assessment 2008-09.
15	Intermediate MB (Phase II): Schedule of Assessment 2007-09, Phase 2.2
16	Cardiff University Clinical Placement Handbook

Document Number	Document Title
17	School of Medicine – diagnostic synthesis in medicine and surgery
18	MBBCh year 5 2009/10 student handbook
19	Policies folder ▪ Absence Monitoring ▪ Collation of Attitude and Conduct Marks ▪ Policy for distribution of student feedback ▪ Policy for supplementary material and lectures
20	Creating short answer questions – Academic Session 2009-10 (Inc marking sheet and exam question template).
21	Examiners Workshop OSCE 2009 slides (years 3-5)
22	OSCE remark guide
23	Guide to setting up and using the Canon DR9080c scanner
24	**Year 5** ▪ Checklist for running Final MBBCh clinical OSCE Exam
25	**Year 4** ▪ Checklist for running final MBBCh clinical OSCE examination. ▪ OSCE – Examination Day task list (February and May) ▪ Examination timetables (February and May)
26	**Year 3** ▪ Academic Skills Procedure Documents: o Essay Under Examination Conditions o Medical Evidence Coursework o Report on Alimentary Poster Presentation o Policy for 3rd Year Skills & Competencies. o Checklist for Running Intermediate MB Clinical OSCE Examination o Intermediate MB Clinical OSCE Examination o OSCE Briefing April 2009 o Year 3 Scanning Process

Section B: Documents for session held on 22 October 2009

Document Number	Document Title
27	Communication from GMC
28	Background Information - Minutes of Examining Executive 13 August 2009 - Minutes of Examining Board 14 August 2009 - Correspondence with GMC: 21 August 2009 and 7 September 2009 - Terms of Reference and Membership - Information Requested from School of Medicine - Overview of timeline for Year 5 Final MB Results
29	Submission from School of Medicine

Section C: Documents for session held 19 November 2009

Document Number	Document Title
30	Notes from first meeting dated 22 October 2009
31	Revised terms of reference
32	Submission to the Investigation Panel Reviewing Assessment and Examination Board Procedures in the School of Medicine
33	School of Medicine Report to the Independent Investigation Panel – 12 November 2009
34	Report from Sub Dean for Assessment, School of Medicine to Cardiff University Investigation Panel
35	Flow of Data Following An Examination
36	Update on Internal Processes: Use of Vivas in Final MBBCh and Classification System
37	School of Medicine Report to the Independent Investigation Panel – 17 November 2009
38	MEDIC Investigation Panel Report, Rhodri Evans - Head of Student Administration

Section D: Other documentary Evidence

Document Number	Document Title
39	Statement to investigation of errors in Cardiff University School of Medicine Finals MB Examinations, Summer 2009
40	Notes of meeting with students: 19 November 2009
41	Assessment and Examination Report: MedSoc Academic Committee 18 October 2007
42	Response statement to investigation of errors in Cardiff University School of Medicine Final MB Examination Summer 2009
43	Validation of Data 2008/09 School of Medicine Examinations (Attached to final report Appendix 4)

Appendix 4

Jill Bedford
Director of Registry and Academic Services 8th December 2009

Dear Jill

Validation of Data : 2008/9 School of Medicine Examinations

1. I refer to your memo to Professor Paul Morgan, Dean of Medicine, dated 23rd October 2009, following the initial meeting of the Investigation Panel that took place on 22nd October 2009, and the subsequent memo dated 26th November 2009 following the second meeting of the Panel on 19th November 2009.

2. This report addresses the actions requested by the Panel and the additional supporting information required by the Panel to enable the Panel to appropriately address the terms of reference for the Investigation.

Conduct a comprehensive validation of all assessment results for Years 3, 4 & 5 students for the 2008/9 session

3. I can confirm that we have undertaken a 100% check of all assessment data for the years 3, 4 and 5 students for the 2008/9 session. We have verified the correct attribution of marks within the spreadsheets relied upon by the Examination Boards for each year, and we have found no further errors, missing data, or inaccuracies in the way that the data has been compiled, over and above the errors that had previously been identified and corrected (details of which are set out later in this report).

4. I can confirm that we have verified the accuracy of the formulae used in each spreadsheet relied upon by the Examination Boards for each year, and we have found no errors in the way that data has been manipulated to meet the published requirements of the relevant Schedule of Assessment, over and above the errors that had previously been identified and corrected (details of which are set out later in this report). An example method statement for the checks completed is attached as Appendix 1 to this report.

5. At the meeting with the Investigation Panel on 19th November 2009, the School was asked to explain in greater detail the process that we have followed in carrying out the validation exercise. The validation was conducted by the School's Undergraduate Office Operations

Manager and IT Manager. The School Manager was the senior manager responsible for overseeing the validation process in the School.

6. The IT Manager developed clear method statements for the extraction of raw marks data from the ASCI (scanned data) files for each element of the assessment in each year. An example of one of these method statements has already been referenced at Appendix 1.
7. In order to enable the data in the ASCI files to be compared with data in the spreadsheets compiled for the manipulation of raw data into aggregated results for reporting to Examination Executive and Board meetings, the Undergraduate Office Operations Manager set up an Access database. The raw data for each candidate (using the School issued candidate number that features on each completed, scanned assessment answer booklet) was imported into the database from the ASCI file. The individual data components were aggregated to recreate the raw cumulative mark for each candidate for each element of the assessment. The equivalent aggregate mark was then imported into the database from the relevant data manipulation spreadsheet, and a 'check total' field was created in the database to identify any discrepancies (ie where the two marks were the same, a check total of "0" was recorded in the database).

8. Incidences where the check total was greater or less than zero were investigated individually to determine whether there were any already known and documented reasons for the apparent discrepancy. Year Co-ordinators (administrative staff with lead responsibility for each of the academic years 3 to 5 of the MBBCh programme) and Year Directors (the lead academics for each year) were involved in providing explanations and supporting documentation to explain these discrepancies as appropriate.

9. The Undergraduate Office Operations Manager and the IT Manager received clear and valid explanations for all apparent discrepancies identified, and the raw marks were fully verified from the ASCI files to the data manipulation spreadsheets for each year.

10. At this stage, the database was used to verify that the School-issued candidate numbers had been correctly matched to the University's unique student identification number, and that both numbers were associated with the correct student by name. No further errors of attribution were identified.

11. Having confirmed that the correct raw mark had been associated with the correct student in the data manipulation spreadsheets, the final stage of the verification process involved the checking of each of the spreadsheets to ensure that the formulae within the spreadsheets for applying standard set adjustments and weightings between elements of each assessment, had been applied consistently and correctly. This was achieved by importing the adjusted marks from the data

manipulation spreadsheets into the Access database, and then applying the necessary adjustments to the raw marks within the database to calculate a comparator mark. As for the raw marks, a 'check total' field was created to identify any apparent discrepancies.

12. The Undergraduate Office Operations Manager and the IT Manager received clear and valid explanations for all apparent discrepancies identified, and the adjusted marks were fully verified from the raw mark within the spreadsheets for each year.

13. The Undergraduate Office Operations Manager then verified that each adjusted mark had been accurately carried forward into the Examination Board report for each year by comparing the mark in the report with the mark in the database. No errors were identified.

14. The final check was conducted by the IT Manager who confirmed that all the formulae and conditional formatting rules in the Examination Board report spreadsheet were valid, were correct, and had been applied to all the data in the spreadsheet.

<u>A detailed account of the errors that have been cited by the GMC</u>

15. <u>Issue 1 : Year 4 written paper 1 – Knowledge and Understanding</u>

Examination date : May 2009

Nature of error : The person responsible for compiling the data manipulation spreadsheet for the Year 4 written papers failed to check that the raw data ASCI file for paper 1 was ordered by candidate number. Students identify themselves on the completed examination paper through a School-generated candidate number. This candidate number is matched to the University's unique Student Number when importing data from the ASCI file into the results manipulation spreadsheet. A small number of data records had been saved 'out of order' in the ASCI file. Subsequently, the raw marks were 'cut and pasted' out of the ASCI file into the data manipulation spreadsheet on the erroneous assumption that the ASCI data was in candidate number order. This led to raw data being attributed to the wrong candidate number in the data manipulation spreadsheet (which was set up correctly in candidate number order)

How identified : The error was identified as part of a comprehensive check of all examination results

data conducted within the School following the discovery of the Year 5 errors

Impact : Whilst the error did not have any impact of the Pass/Fail status of the twenty students directly affected, the revised final results did result in changes to the FY1 rankings for fourteen students in the year group

Corrective action : Revised information was submitted to the Postgraduate Deanery in sufficient time for corrections to be made and applied to the data that will inform the FY1 application process in 2009/10. Revised transcripts confirming their amended results have been issued to all affected students, and all students have received confirmation of their revised FY1 ranking information

16. Issue 2 : Year 3 results – distinctions and merits

Examination date : Not applicable

Nature of error : An error was made in the selection of results data in respect of the Academic Skills Panel (completed and assessed at the end of the second year) and its incorporation into the results spreadsheet for the Intermediate MB Examination Board (end of year 3). This data is one of the components that is used to calculate the average mark for students at Intermediate MB, and this in turn determines whether a student is deemed to have passed with a Distinction or a Merit

How identified : The error was identified as part of a comprehensive check of all examination results data conducted within the School following the discovery of the Year 5 errors

Impact : The originally published results for the year 3 cohort were incorrect insofar that the classification (ie Merit/Distinction) for students who had passed Intermediate MB had been assessed using incorrect data

Corrective action : The correct data was brought into the results spreadsheet and corrected transcripts were produced and sent to all students, alongside an explanation of what had happened

17. Issue 3 : Year 5 results (Final MB Part II)

Examination date : Thursday 11th June 2009 (EMQ – Written Paper 2)

Nature of error : The person responsible for compiling the data manipulation spreadsheet for the Year 5 EMQ and DI papers failed to check that the raw data ASCI file for the EMQ paper was ordered by candidate number. A small number of data records had been saved 'out of order' in the file. Subsequently, the raw marks were 'cut and pasted' out of the ASCI file into the data manipulation spreadsheet on the erroneous assumption that the ASCI data was in candidate number order. This led to raw data being attributed to the wrong candidate number in the data manipulation spreadsheet (which was set up correctly in candidate number order). This led to the wrong results being attributed to 137 students in the cohort. The lack of any formal system for checking the spreadsheet at that stage and before data from it was presented to the Examination Board, meant that the initial error was not identified

How identified : The error was identified as a result of checks on the data undertaken to verify the results of a student who had originally been told that s/he had failed Finals having achieved a result of less than 50% in the Knowledge & Understanding module (comprising the EMQ and Data Interpretation papers). On tracing the results back, it became clear that the wrong EMQ score had been attributed to this individual and that s/he should in fact have passed. This led to a detailed review of the results for the EMQ paper and the extent of the error was revealed

Impact : One student who had originally been told that s/he had failed Finals was subsequently confirmed as having passed and was able to take up the allocated FY1 post. Four students who had originally been told that they had passed Finals, and had started their FY1 posts, were subsequently identified as having failed the Knowledge & Understanding module and therefore as having failed the overall examination. These students were suspended on full pay from their FY1 posts from 1st August 2009 to 18th November 2009 pending the outcome of

appeals against the University's decision to withdraw their degrees, and associated complaints about the way in which the University handled the issues. The four students incorrectly recorded as having passed the Finals examination have all enrolled to re-sit the Final Year, and have re-engaged with the programme.

In addition, three students will receive amended degree classifications as a result of the correction of their EMQ paper results, moving from Pass to Commendation, or Commendation to Honours

18. Issue 4 : Year 3 OSCE Examinations

Examination date : April 2009

Nature of error : The GMC has been misinformed about the position in respect of this year's OSCE examinations as part of the Intermediate MB examination. No students were advised that they had passed when in fact they had failed. At the Examination Executive meeting prior to the interim Examination Board in May, it became clear that the drafting of the Schedule of Assessment for Intermediate MB for 2008/9 was unnecessarily complicated. In particular, the inclusion of a number of negative statements within the Schedule had the effect of allowing the sections relating to OSCEs to be interpreted in two equally justifiable ways, either that at least six stations of ten needed to be passed to secure an overall pass, or that at least four stations needed to be passed. The Executive recommended to the Examination Board that in this context, the fair and equitable thing to do would be record as having passed, those students who had passed at least four stations and secured a mark of greater than or equal to 50% overall for the OSCE examination. This was agreed at the Examination Board in May and the approach was applied to those taking the OSCE examination in July. In addition, those students who passed the overall examination but had actually failed more than four stations were given detailed feedback and offered additional guidance about how to improve their clinical skills to ensure that they were adequately prepared when progressing into Year 4

How identified : The issue became clear at the Examination Executive meeting to review the results data prior to the Examination Board meeting in May (that is, after the main OSCE examination)

Impact : None

Corrective action : The Schedules of Assessment for Years 3 to 5 for 2009/10 have been reviewed in detail under the lead of the Sub-Dean for Assessment and have been substantially re-written to remove to the fullest extent possible any scope for misunderstanding or confusion

19. Issue 5 : Year 4 Marks 2006/7

Examination Date : Not applicable

Nature of error : The statement prepared by the former Sub-Dean for Assessment and issued to students at the time, explains that there was an error in the compilation of data in respect of one element of the Attitude & Conduct marks. Specifically, an upgrade to the spreadsheet software package meant that data that had previously been read as numeric data in earlier versions of the software, was treated as non-numeric data in the upgraded version. Thus, whilst all the marks were visible on the spreadsheet, one section of marks had not been included in the overall calculation because they had been entered as non-numeric data

How identified : The issue was identified by the former Sub-Dean for Assessment in reviewing the Year 4 results data following various queries from students in relation to the results as a whole (it should be noted that no other problems were identified)

Impact : No significant impact on students. The error was identified and corrected before the FY1 ranking data was compiled

Corrective action : The data format was amended such that entries in subsequent years were properly treated by the spreadsheet as numeric data

A detailed account of any further errors in respect of the 2008/9 examinations

20. Issue 6 : Year 4 OSCE examination data in child health

Examination date : May 2009

Nature of error : The child health OSCE examination in year 4 is completed at the end of each placement. The results data for the May 2009 examination were scanned accurately and completely and were then migrated into a data manipulation spreadsheet for standard set calculations to be applied. Despite the fact that the standard set marks for 2008/9 had been applied to the data successfully on the four previous occasions that the examination had been run in the session, for the May cohort of students the standard set data from 2007/8 was used. We are not able to provide any explanation for this human error

How identified : The error was identified as a result of a request from another student in the same cohort for feedback on his performance in the Child Health examination

Impact : One student who had previously been presented to the Final MB Part 1 Examination Board as having failed the year, having failed seven out of 16 OSCE stations overall (his overall score exceeded 50% for the clinical examinations but he had failed more than six stations) has had his results amended as he had actually only failed six stations. He has now progressed into the Final year of the course (the error was identified and rectified in time for him to start the final year at the same time as his contemporaries). The error affected the results of the entire cohort (70 students) but influenced the pass-fail decision only for this one student (i.e. whilst the results for the 70 students in the cohort were effected, this only had an overall pass : fail implication for one student in the cohort). Results for all in the cohort have now been amended and revised transcripts have been issued

Corrective action : New protocols are now in place for the secure storage of standard set data to minimise the possibility of incorrect data being selected for use in the examinations from 2009/10 onwards

21. Issue 7 : Year 3 Written Paper – error in compilation of Pass list

Examination date :	April 2009
Nature of error :	One student who was correctly identified as having failed written paper D as part of the Intermediate MB examination, was incorrectly included on the Pass list published immediately following the Examination Board meeting
How identified :	The student noticed the error on receipt of her results transcript (which correctly identified the paper D fail) two weeks after the Examination Board meeting
Impact :	The student re-sat the paper as part of the normal arrangements for re-sits at the end of year 3, and failed again. Given the delay of two weeks in advising the student that s/he had failed at the first attempt, s/he is being allowed to re-take the year as a first attempt

Details of any other exam mark errors that the School knows to have occurred in the last 5 years and additional to those detailed above

22. We have not identified any further examination mark errors additional to those identified in the earlier sections of this report. We know that there have been instances of individual students at Intermediate MB (end of year 3) and Final MB Part II (end of year 5) having initially been given an incorrect classification having passed the examinations (ie either Pass/Merit/Distinction or Pass/Commendation/ Honours). These have been isolated issues and have not involved errors with the marking of individual examinations per se, but rather in the way that marks across academic years have been aggregated to determine the correct classification.

Conduct a comprehensive validation of all examination/assessment results on a longitudinal basis across years 1-5 for the cohort graduating in 2008/9

23. Representatives from the Medical School contacted the former Sub-Dean for Assessment to discuss the most appropriate means of approaching this task. The former Sub-Dean for Assessment was able to provide a detailed method statement explaining the means by which data had been managed and reported for the three years up to 2007/8. This statement is attached as Appendix 2 to this report.

24. It is clear from the method statement that the error that led to the problems with the examination results in 2008/9 cannot have

occurred in previous years because data was never ‘cut and pasted’ from one source to another.

25. Nevertheless, we have conducted a comprehensive validation of the data across years 1 to 5 of the graduating cohort in 2008/9 (following the exact same process as that described in paragraphs 5 to 14 of this report). We can confirm that no errors were identified in the results data and subsequent Examination Board reports for this cohort of students.

Yours sincerely

Professor B. Paul Morgan
Dean of Medicine and Head of School

Appendix 1

Year 3 Checking Process

V1.0 Tim Cross, 29th October 2009

1. OSCE's

   a. Open the final results spreadsheet located at:

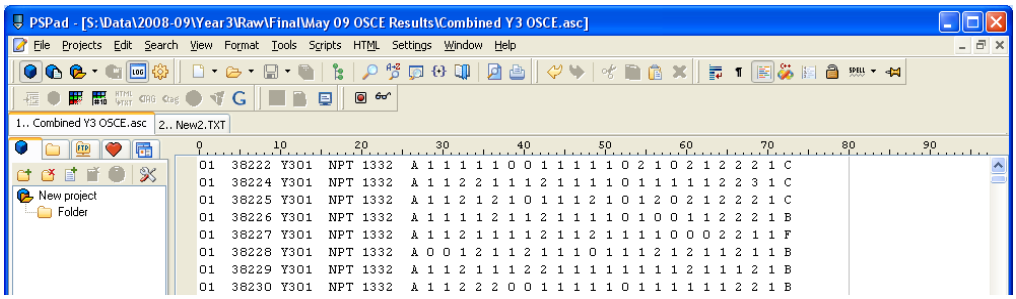
   S:\Data\2008-09\Year3\Reports\Interim\YR3OSCEFINAL.xls

   b. Locate the "Y301" worksheet tab through to the "Y310" tab (these are the 10 OSCE stations).

   c. Locate column AD "Raw Mark". This is the raw mark column and needs to be checked against the ASCI file.

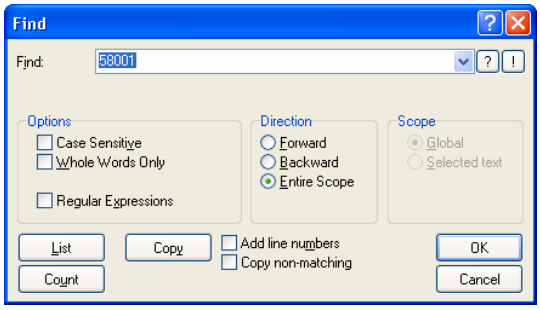
   d. Keeping the above spreadsheet open, open the following Asci file using PSPad:

   S:\Data\2008-09\Year3\Raw\Final\May 09 OSCE Results\Combined Y3 OSCE.asc



   e. The ASCI is arranged in columns, the first one "01" is the paper number (there are 10 OSCE's in Year 3), the second "38222" is the candidate number, the third "Y301" is the station code, the last "A" is the answers – all the numerical numbers after "A" need to be added together to achieve each of the candidates raw mark. The last column "C" is the station group. The problem is that the ASCI file is unordered and papers have been scanned at different times. This is where PSPad can help us

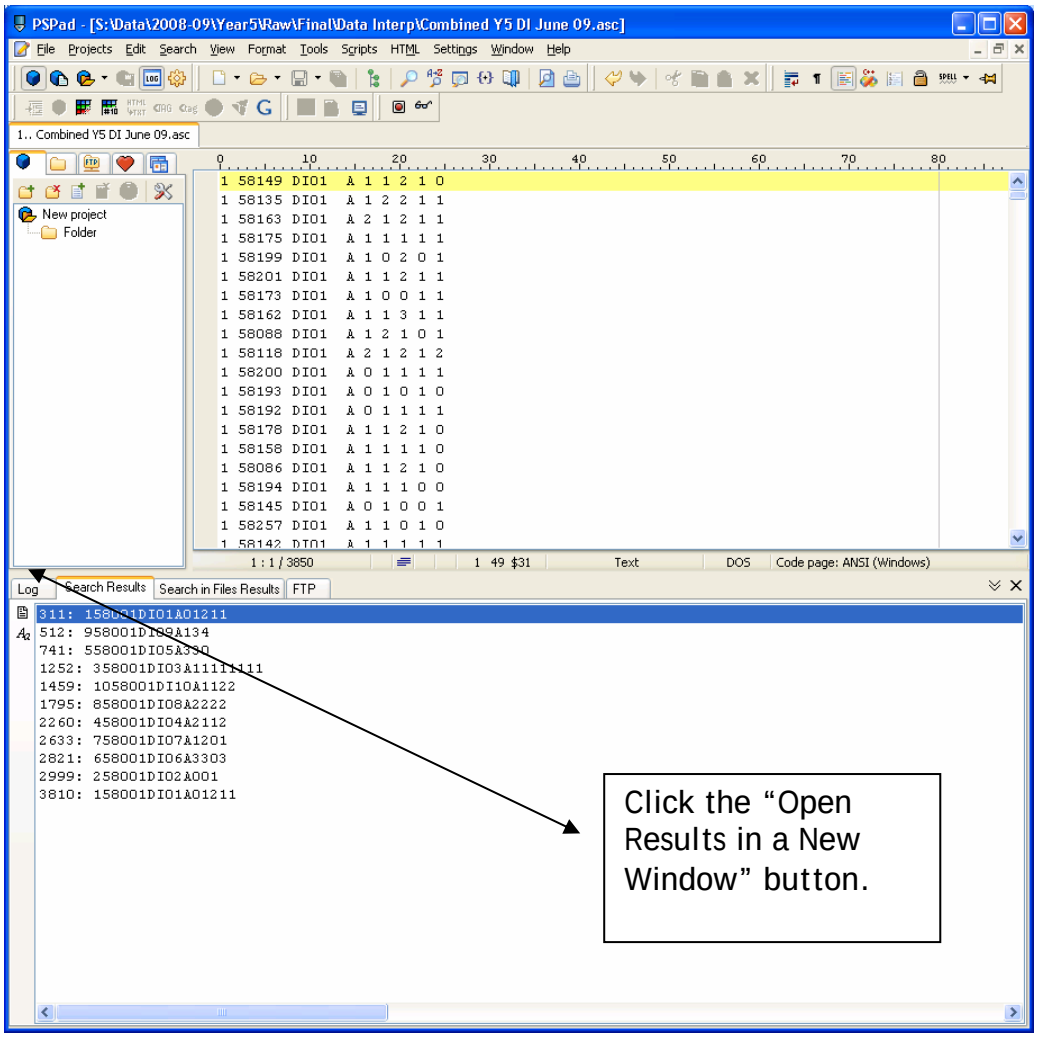
f. From the PSPad toolbar click on Search and then Find…



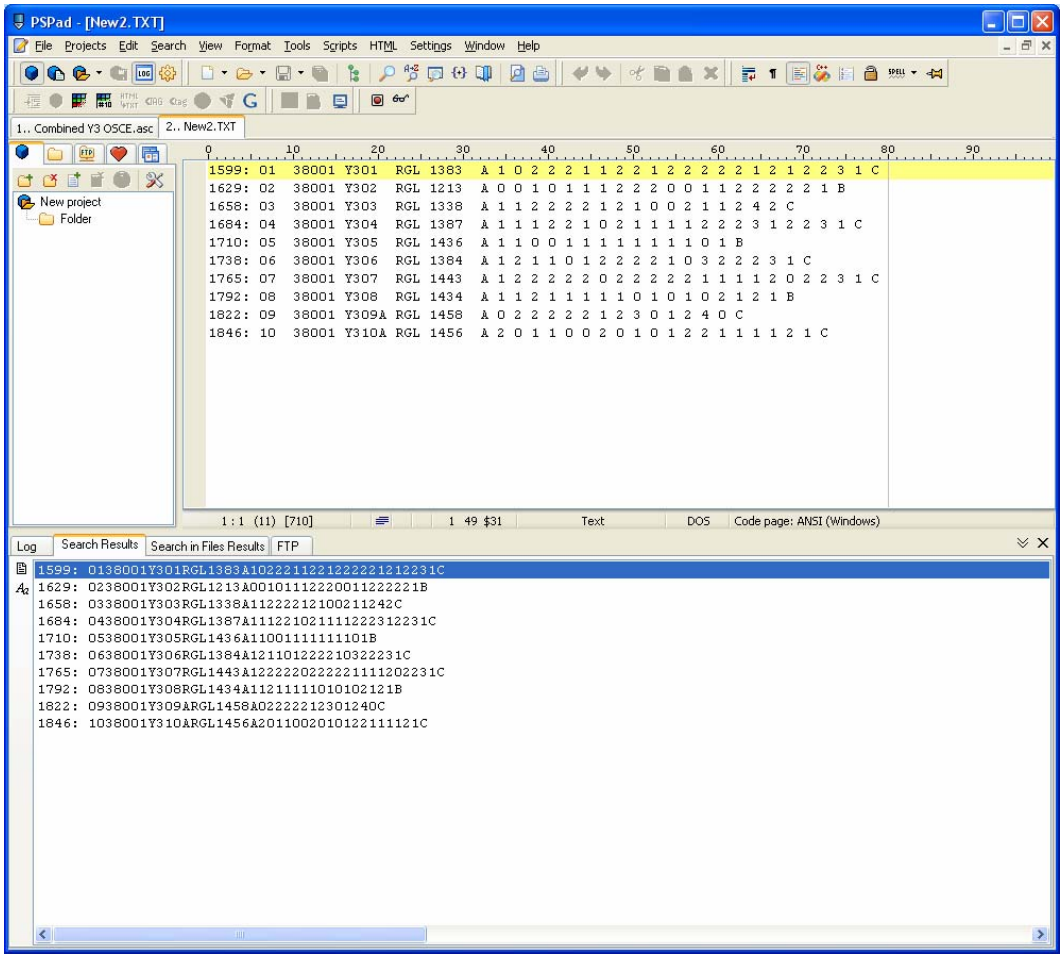
Make sure "Entire Scope" is selected.

g. Enter the first candidate number in the find box (e.g. 38001) and then click the **LIST** button.

h. You can maximise the list results by clicking the double chevron button "^" at the search results window. Then click the "open results in a new window" icon as indicated below…



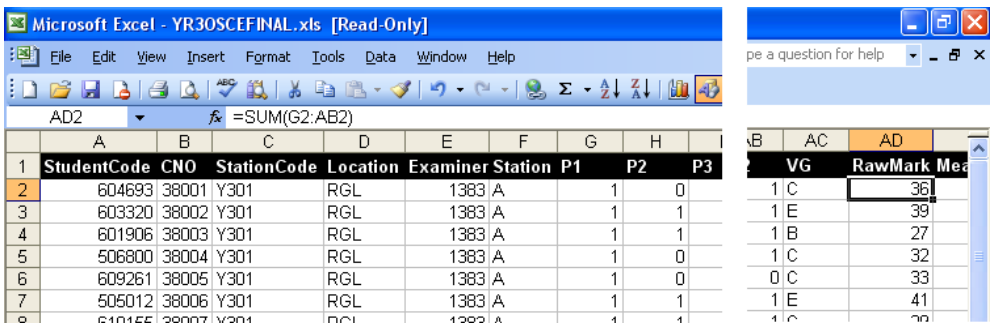
i. There should be 10 results for each candidate number.



j. Next you to compare the above ASCI file results to that in the final spreadsheet you opened in step a).

k. Find the first Candidate number (e.g. 38001) and then the first Station Code (e.g. Y301). Count the line of results in the ASCI file (e.g. 1,0,2,2,2,1,1,2,2,..etc = **36**) for the first station. In the first line, this means the candidate at station <u>Y301</u> achieved a total score of **36**.

l. This score (**36**) should match with the final Excel Spreadsheet "**YR3OSCEFINAL**.xls" Y301 worksheet tab as below (Raw Mark column). Making sure you are looking at the correct Station Code and Candidate number:



m. Complete the above checks for the other Y3 Stations for the same candidate.

Appendix 2

Cardiff University School of Medicine
Assessment Arrangements 2007-2008

BACKGROUND

This document describes the arrangements for the scoring of EMQ and OSCE assessments, their subsequent collation into final spreadsheets and the determination of outcomes in Year 3, 4 & 5 of the medical course. The assessments took a variety of forms but these documents relate primarily to the provision for the large end of phase examinations.

The process was under the management of the Sub-Dean (Assessment) who oversaw all the components outlined below.

Managing the assessments for a large medical school poses significant logistical problems and to address these the process was recognised to have several phases all of which introduced the possibility of error. The Sub-Dean chose to manage the process as follows,

1. Start of Year Preparations

a. Each student was allocated a candidate number. These numbers were carefully checked to ensure that each student had a unique code and that the codes reflected a standardised sort of the students on the basis of their surnames and first names as derived from central student records. An iterative process was undertaken until the central and School master candidate lists matched exactly. This list was matched with the University number and then used as the basis for reporting (almost) all scores or outcomes from in-course assessments as well as the formal EMQ and OSCE end-of year-assessments. This process was deemed necessary as,

i. Different software applications cannot be relied on to sort alphanumeric data consistently.

ii. The assessment code was structured in a way that would allow consistent sorting and identification of student assessment records.

iii. The University number is large, inconsistently created and cannot be relied on as the basis for sorting students.

iv. The highly structured combination of University Number and local candidate number allowed the consistent matching of students to their assessment scores.

EVIDENCE: The lists are available for inspection and evidence of their use is clear in the assessment data.

2. EXAM SCRIPT PREPARATION

a. Collection of exam questions for each EMQ paper was commenced in the Autumn Semester by the Panel Leaders & Year Coordinators. This process was coordinated by the Year coordinator.

i. Papers were then compiled by the module leaders and then standard set by a multidisciplinary panel using a pre-defined process and templates.

EVIDENCE: The standard-setting templates and results are available

ii. The scripts were proof read by the Year Coordinator and checked by the Sub-Dean.

b. The Finals OSCE assessment was prepared closer to the exam period as it required attendance of patient. This process was overseen and checked by the Sub-Dean (Clinical).

c. The Year 4, Child Heath in-course OSCE assessment was prepared by the Child Heath Panel leader and checked by the Sub-Dean (Assessment).

d. Each element of the OSCE scoring system was allocated to one of 5 Learning Domains and this was used to provide feedback to students on their performance.

EVIDENCE: Samples of the feedback provided are available.

EVIDENCE: From minutes of year assessment groups.

3. PRINTING OF EMQ SCRIPTS & OSCE SCORING FORMS & EXAM ROOM PROCEDURES

a. The EMQ Scripts (Years 3,4 &5)

i. The EMQ scripts are completed by the candidates and each candidate receives a bound exam script containing all of the questions.

ii. The EMQ Scripts were formatted according to pre-prepared templates that standardised the format of each element and resulted in a paper that could be machine read (scanned).

iii. Each script was identified by a unique bar-coded (machine readable) script number and each page of each script also contained this number as well a bar-coded page number. This format ensured that scripts scanned with pages out of order could be identified. The barcodes were carefully checked to ensure that the barcodes were printed at a size optimal for consistent reading by the scanning software. Each barcode was checked (by admin staff and the Sub-Dean (Assessment)) to ensure that they coded the page and script numbers correctly.

iv. Example exam papers were made available to candidates well before the assessment along with instructions as to how to complete them. These instructions were repeated at the commencement of each examination. The structure of the papers was discussed at Student-Staff Consultative Panels.

EVIDENCE: Minutes of Student-Staff Consultative Panels

v. The scripts were allocated randomly to students who were required to personalise them by entering their candidate number into a machine readable matrix and writing their full name on the script. Lists of the candidate number allocated to each student were available outside the exam hall.

vi. The questions had a range of choices lettered A-H (Not all elements used the full range). The students were instructed to shade a labelled box opposite the answer text to indicate their choice. They we also required to write the letter code of their choice.

vii. At least two elements of each paper required the students to respond to a question in their own words. This answer was scored by an examiner who entered the marks into a machine readable matrix on the script.

viii. Scripts were collected before the students rose from their desks and scrutinised to endure the presence of a candidate name.

ix. This process results in a lot of paper to scan but does not require the candidates to enter their answers on separate sheets and allows very tight QC of the scoring (*vide infra*).

x. Extra scripts with numbers 9990-9999 are produced and used as samples to validate the scanning process as well as models from which the scanning templates are produced.

b. The OSCE Scripts

i. The OSCE scoring forms are completed by the examiner who enters marks into a machine readable matrix. Each candidate is given a loose-leaf plastic folder containing their individual scoring forms for each station.

ii. Each scoring form contains bar-codes identifying the candidate, the station, the venue and the sitting. The last two id's are only relevant to in-course assessments where students may be examined at different points of the course and in different venues at the same sitting.

iii. The candidate is identified by bar-coded candidate number and by full name on the script. These are

merged onto individual scoring forms from the master candidate lists referred to in 1.a.

iv. Extra stations with candidate numbers 9990-9999 are produced and used as samples to validate the scanning process as well as models from which the scanning templates are produced.

EVIDENCE: Samples of scripts, script templates, Instructions to candidates, Instruction on template preparation.

4. Machine Reading (Scanning) of Individual Candidate Scripts

a. The scanning was carried out using Remark™ (Ver 5.5 for EMQs and Ver 6.0 for OSCE) software a well established commercial product to drive high-throughput Canon™ scanners. Remark software was chosen because it allowed the production of customised assessment script templates using Microsoft Word™ and provides facilities recognising scan errors during the scanning. These templates could then be merged with the master candidate list(s) (*1a*) to produce individualised exam papers that can be machine read but allow the candidates to enter their answers opposite the relevant question.

i. Different versions of the software were used because the newer version afforded facilities required for OSCE but not for EMQ papers and it was decided, for the sake of stability, that the earlier version that had already been used locally (BSc courses) for EMQ papers would continue to be used until experience could be gained with the new version.

b. The scanners were routinely overhauled before each major exam period (May) and several spare sets of paper-feed wheels were held in stock as these are rapidly abraded by the large number of sheets scanned. (c. 200,000 for all exams).

c. A secure assessment room was prepared to allow the safe management of the scripts and their collation and checking on receipt from the exam venues.

d. Staff were rigorously trained in the use of the scanners and were routinely supervised during scanning. The underlying philosophy was to prevent problems occurring. Staff were particularly advised on,

i. Ensuring that the feed hoppers for the scanners were not overfilled. This can lead to incorrect reading – would usually be detected (*vide infra*) but it was considered best to prevent the problem.

ii. Ensuring that the scripts did not contain foreign matter, such as debris from rubbings-out, by fanning them and then ensuring that the stack was even by tapping the edges on a smooth bench.

iii. Staff were trained to remove paper dust and other debris from the scan path by wiping the relevant parts with a damp cloth after three stacks of scripts had been scanned.

EVIDENCE: See scanning instructions document (s).

e. SCANNING OF EMQ PAPERS

i. EMQ scripts were immediately sorted into script number order when they arrived in the assessment room.

1. A printout of the master candidate numbers was then annotated with the number of the script used by each candidate.
2. Candidates who had not submitted scripts were identified and those absent identified from the documents supplied by the exam supervisor. Any "missing" scripts could then be identified and found. Eg occasionally completed scripts found their way into the "spares" pile or had just been "misplaced" in the exam room.

ii. The stapled corner holding the pages of a script together was then carefully cut off with a guillotine and the "Header" page containing the candidates name removed. The header pages were stored in script order and the answer pages accumulated in piles of 10 candidates to wait scanning.

iii. The scripts were scanned in batches of 10 (c. 200 sheets). During scanning the software flagged any anomalies and these were dealt at the end of each batch and changes made noted. Remark is particularly good in that when reviewing anomalies it display the scanned page so that the operator can review the actual problem on the script. The following anomalies were identified and corrected,

1. Students occasionally "forgot" to enter their exam number. This was corrected by obtaining the student's name from the script header and then the exam number from the master candidate list.
2. When no choice had been made for a question the script was checked to ensure that it had not been entered so faintly that it could not be read or

that the candidate had "forgotten" to shade the answer box. If this was the case and the candidate had indicated their choice by a letter then their answer was entered.

3. Occasionally the scanner detected that multiple choices had been selected. If the candidate had entered a choice letter then they were allocated that answer. If they had not entered a letter then the result was left "Blank" and the scoring software would give them a 0 mark for that question.
4. Very occasionally the system could not read a barcode and this was also corrected at this point.

EVIDENCE: This process can be demonstrated.

iv. Once all scripts had been scanned the results were written out in a tab-delimited ASCII format. The file contained a header indicating the each question number and its type that was followed by lines each containing the results for one candidate.

EVIDENCE: Samples of these files are available for inspection

v. Sample scripts that had been "answered" at random were also scanned and manually (or is it visually) checked to ensure that the scanning process was performing properly.

EVIDENCE: Examples of sample scripts and RWM's notes.

f. SCANNING OSCE PAPERS

i. This exam is run as a series of Stations and each station produces a single results sheet and a complete exam comprises of up to 20 of these sheets.

ii. It cannot be guaranteed that all sheets from a candidate will be received together or that they will be in any particular order when received in the assessment room. Sorting these sheets (c. 8000) would be time consuming and error prone. Scanning and analysis processes were therefore developed that did not assume that the results sheets were received and scanned in any order. This was only possible because each sheet was uniquely identified by barcodes containing the candidate number and the Station code.

iii. A set of test scripts were scanned were scanned to ensure that the templates had been set up correctly and that real data could be scanned accurately.

EVIDENCE: Examples of test scripts are available

iv. The scripts were collated and in batches of 200. The scanning software was configured to "recognise" each station from the barcode and read it properly (needs Ver 6.0).

v. After each 200 stations any scan errors were corrected. The scan errors were usually due ,

1. A failure to read a barcode (infrequent).
2. Blank mark blocks where the scanner was not been able to read faint marks. The intended score was identified from the document scan or where necessary from the original script and entered.
3. The examiner had failing to enter a mark. In this case the score was left as blank and the analysis programme would give the candidate the full marks for that question. NB admin staff were present at the assessment venue to check that form had been completed and to request marks from the examiner when possible.
4. On completion of scanning the programme produced a tab-delimited ASCII file where each line contained the result for a candidate for a station. Thus there would be 20 lines for each candidate in a 20 station exam.

EVIDENCE: Example files and scanning handbook.

5. ANALYSIS OF SCANNED EMQ DATA

This analysis was carried out using software produced in-house. The programme was designed to control the analysis workflow and only allow the operator to proceed as each stage was completed and any data errors were corrected. The analysis process was as follows,

a. The tab-delimited results file (4,e,iv) was read and the structure of the paper extracted by parsing the header file. At the same time the master candidate list file was read and parsed.

b. On successful completion of a. the operator was given the opportunity to enter the correct answers. This is a tedious process and was usually carried out in pair with one person checking the entries made by the other. On completion of the process a final check was done by reading back the entries. This list provides the criteria for marking and for QC of the marking process. This process was often undertaken before the

assessment by using data from an identical test paper The entries include,

i. The code letter (A-H) of the correct answer for EMQ questions

ii. The range of acceptable answers for that question so that the software can check that all scanned values are in the acceptable range

iii. The maximum mark achievable for an examiner marked question.

c. Now that the key analysis parameters are entered the operator can compare the results file with the master candidate list to check for the following errors,

i. Missing candidates. ie candidates in the master candidate list for whom there are no results. The programme prints a list of such candidate containing their name and examination number. This list is first correlated with the list of non-attendees from the exam venue. At this stage in the process it is unlikely that a script will be actually missing and so any such errors are usually due to the candidate entering an incorrect exam number.

ii. The case where the incorrect candidate number is actually another candidate's number is identified from a list of duplicate candidate numbers printed by the programme. The correct candidate numbers can then be identified from the header pages and the annotated master candidate lists. The results file is then corrected and save as a new version - the original version is kept to preserve an audit trail of the changes.

iii. Scripts from non-existent candidates – this could occur when a candidate has entered the wrong candidate number

d. Once any changes have been made the analysis is started again with the expectation that no unexplained missing candidates will be found.

e. When the dataset is correct the results are actually marked. This part of the software also produces records of the following anomalies should they occur.

i. Answer codes that fall outside the accepted range. This error has never occurred and would represent a serious system failure if it did.

ii. Scores from manually marked questions that are out of range.

iii. Scripts where all the pages are not present and in the correct order or where pages from other scripts are intermingled. This error could occur where pages are mixed up when collating them ; it has never occurred.

iv. Such errors, should they occur, would have to investigated and rectified before.

f. Once so called marking errors have been corrected the analysis recommenced from the start until an error free run is produced.

g. The data has now been analysed successfully but there may be problems due,

i. The correct answers being entered incorrectly

ii. The correct answers being wrong.

iii. There being more than one correct answer or reasonable answer due to the question being formulated imprecisely.

h. The programme produces a graphical analysis of the answers given for each question and indicates situation where the consensus answer of the candidate group was highly different from that given by the examiners. This analysis is sent to the Panel Chair and the Year Coordinator to review and where necessary correct the answer given and possibly to allocate 0.5 or 1 mark to other answers that may be reasonable on reflection.

i. The answer file is then amended and the analysis re-run from the start and analysis of the answers re-checked to ensure that requested corrections have been answered.

j. At this point we now have an error free run of the analysis and can accept the results file that it produces. This tab-delimited ASCII file contains the overall result for each candidate indexed by examination number.

EVIDENCE: The iterations of each analysis are documented and signed off. They are available for inspection. The software and its use can be demonstrated on data from the appropriate exam period.

6. ANALYSIS OF SCANNED OSCE DATA

a. A separate programme has to be produced in-house to analyse the scanned OSCE data. The programme was designed to control the analysis workflow and only allow the operator to proceed as each stage was completed and any data errors were corrected. The programme is different from the EMQ programme in that,

i. it can rely on the scanned data to identify the subject by examination number.

ii. It must cope with scoring data from stations in no particular order.

iii. It requires a template file to identify the scoring structure of each station. This template contains

1. A textual description of each item for which marks are allocated
2. The maximum mark available for each element
3. The learning domain that each element tests (1 of 5). This is used for producing candidate feedback.

b. The master candidate list is first read into the programme. Then the template file is read and parsed. This latter file is highly structured and the programme can detect whether it is properly constructed. If it does not read then it must be corrected and the analysis programme restarted. This process is usually test with an example data set before it is used properly.

c. The programme then checks for

i. Missing candidates. These may occur because of candidate absence or because papers have been misplaced during transfer.

ii. Incomplete sets of station results. These can occur when station sheets are misplaced or a student fails to complete the assessment.

iii. The above problems are usually easily rectified by finding the missing sheets still in their original folders in which case they have to be scanned and the resulting data appended to the original scanned data file.

d. The data can then be analysed to produce the final scores for each candidate. This analysis checks for scoring errors where the scanned data is incompatible with the template information. No errors have been found at this stage due to the very structured nature of the data.

e. At this point we now have an error free run of the analysis and can accept the results file that it produces. This tab-delimited ASCII file contains the overall result for each candidate indexed by examination number.

EVIDENCE: The iterations of each analysis are documented and signed off. They are available for inspection. The software and its use can be demonstrated on data from the appropriate exam period.

7. Collation of Marks and Production of Final Spreadsheets.

   a. The final collation of marks was done using Microsoft Excel™. All of the marks for the year were contained in tab delimited ASCII files or Excel spreadsheets. In compiling the final results the following issues were taken into account.

      i. The master page of the final spreadsheet was created using the master candidate list. This list contained not only the candidate number but also the university number. This latter number was used to incorporate data from earlier years.

      ii. Data was incorporated into the master page by using the DBLookup function of Excel to match the master candidate exam or university number. This obviated need for cutting and pasting data and allowed the automatic identification of anomalous numbers.

      iii. All calculations for the collation of data in the spreadsheets was carried out using VBA rather that the built in Excel macros as this is highly structured and much easier to debug than macros.

      iv. Extensive use was made of the built in range colour coding function to identify outlying or missing marks.

      v. Two types of spreadsheet were produced,

         1. Highly detailed sheets showing all of the data contributing to the final outcomes. These were provided to the exam executives for them, to review and identify any issues with the marks – the candidates were anonymous.

         2. Final outcome spreadsheets for the Examining Board. However, the detailed sheets were made available to the examiners.

   b. Quality Control

      i. Random samples of the data presented on the final spreadsheet were tracked back through the process to ensure that they were valid.

      ii. Random samples of the final outcomes were manually calculated. Here we fell afoul of an Excel quirk in that its macro rounding function does not behave as expected. This was identified when doing final checking of results for prizes. All results were then rechecked to ensure that the outcomes were safe. No pass/fail decisions were incorrect but some of the merit /distinction allocations were incorrect. These were changed and following School policy a letter was sent

out to all candidates apologising for the errors and correcting them.

iii. All student appeals were manually remarked and no errors found.

EVIDENCE: Samples of the spreadsheets are available.

CONCLUSION

Enormous care was taken in all aspects of preparation, marking and reporting of the assessments. The process was overseen and managed by the Sub-Dean Assessment as is appropriate for such a complicated process. This lead to a high level of confidence that the published outcomes are valid.