

Project Title:	Quality Improvement of Image Grading
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Executive Summary

After 12 months, the project progresses well and partners continue to work together positively and supportively. Activity levels and feedback shows much positive engagement and reported benefits from involvement in this project.

Objectives 1, 2 & 3: Utilisation of the international quality assurance and educational support system Test and Training (iTAT) has been very successful in Bangladesh and is used to a lesser degree in Indonesia. Botswana regrettably still has no current activity on iTAT. The additional countries (since Pilot phase) of Malawi, Tanzania, Zambia and Uganda are not yet scheduled to come on-stream with iTAT but are otherwise progressing well (see Objective 5). The iTAT system has now been translated into Bahasa Indonesian and we hope this will help staff in Indonesia to engage more fully with the system in the future. We have progressed well with presentation of the output of 'severity level' for cases in iTAT as Early Treatment Diabetic Retinopathy Study (ETDRS)-equivalent notations. This should help any user who is not entirely familiar with the NHS-DESP standard notation, used by the national Diabetic Eye Screening Programmes in England, Wales and some other countries. We decided not to further pursue the development of the iTAT output as AAO/International Classification severity levels, as this was not deemed to be particularly clinically reliable or worthwhile.

Objective 4: There has been no purchase of laptop computers or mobile (cell) phones. Limited feedback from partner sites indicated that there could be significant problems associated with equitable access to the IT / telecommunications equipment, safe and secure storage could be problematic and new IT/telecoms equipment would not help to provide any additional protected time for partner staff. We have not yet completely abandoned the idea to purchase and supply such equipment; resulting in a significant underspend on those items.

Objective 5: There has been an excellent uptake of students wishing to undertake the formal University qualifications offered to them; to the extent that more than originally estimated are studying the full Level 4 Certificate of Higher Education in Diabetic Retinopathy Screening. A total of ten students from Bangladesh, Indonesia, Malawi, Tanzania and Zambia were registered on the various qualifications which commenced in September 2016. All of these successfully applied for bursary funding through this project to support their studies. Seven further students from Ghana, Kenya and Nigeria (outside the original application) were also admitted to the September 2016 cohort – all of whom are studying the full Cert HE in DR Screening. Feedback from students has been extremely positive and they recommend the course(s) to colleagues as being challenging but most worthwhile.

Objective 6: The project continues to be managed by staff in Gloucestershire Hospitals UK with no staff changes or significant problems. Most project milestones have been delivered on-time and within budget, although there have been a few delays to some 'key pathway' items which have caused some knock-on delays. These are all now back on-track and require no remedial action.

There are underspends against budget on project Objectives 2 and 4. Currently (end of month 12) we are 18% underspent with a projection of a possible 32% underspend by month 18. We propose to rectify some of this underspend if the project timescale can be extended by a further 6 months.

Key highlights from this project period

Key Highlight 1: Staff from Bangladesh continue to participate in iTAT and perform very well compared to specialist NHS-DESP grading staff from England taking the same grading sets using TAT. *(Project Objective 1)*

Key Highlight 2: Translation of the iTAT site to Bahasa Indonesian is complete, with final testing underway. It will be available during April 2017. *(Project Objective 2)*

Key Highlight 3: Managing users of iTAT will soon be able to specify the format in which their staff can see the output results in either ETDRS- or NHS-DESP style. *(Project Objective 3)*

Key Highlight 4: Ten students from the five original countries supported by this project are currently studying for the formal University qualifications and are progressing well. Seven further students from three new countries are also progressing well with their studies. *(Project Objective 5)*

Key Highlight 5: Student VM from Malawi has recently completed the University of Gloucestershire's Certificate in Grading and will shortly receive the Certificate from the University. VM will transfer to being a supported user of iTAT. *(Project Objective 5)*

Key Highlight 6: Student feedback shows a high rate of confidence and relevance in the teaching content, delivery methods and opportunities to achieve the Learning Outcomes. *(Project Objective 5)*

Original Innovation Idea (from Pilot phase)

- A web based system to enable high quality diabetic retinopathy screening and grading services to be provided in resource poor settings through the establishment of an efficient on-line training and accreditation system for program staff.
- This system will also allow for the provision of year on year improvements in performance in detection of sight threatening lesions of diabetic retinopathy.
- This system will enable graders to obtain continuous feedback on grading quality through routine testing and evaluation with feedback

How will additional funding help your Innovation Idea? (Preparing to Scale phase)

1. Provision of iTAT for QA (managed locally and supported externally) to a wider audience in additional locations with enhanced user- and manager-feedback from experts. Access to the external QA system will help to improve knowledge and understanding of features of diabetic retinopathy and support enhancements in appropriate referral of cases of potential sight-threatening diabetic retinopathy. Expansion of the learning materials developed during the pilot phase will provide ready remote access to a range of on-line served learning resources to continuously improve knowledge and skills.
2. Immediate language translations into Bahasa Indonesian and Spanish with call-off option to translate into at least 3 other languages if indicated from feedback.
3. Development, verification, testing and implementation of algorithms necessary to provide iTAT retinopathy severity outcomes as ETDRS- and AAO-style terms.
4. Call-off funding to support locations with insufficient IT infrastructure or without access to appropriate and adequate equipment to make effective use of iTAT, the learning environment and sharing of best practice. The necessary equipment identified to support this (in each eligible location) would comprise: 19+ inch high resolution monitor on which to view retinal images; laptop computer to drive the monitor and access the internet and support learning and development; laptop to be equipped with suitable in-built camera and software to support Skype-style video conferencing; 3-G or 4-G mobile telephone from a suitable and stable local network provider to enable access to the internet (if local broadband is inadequate) and to promote local communications and information-sharing. Not all locations or users would require all the items of IT equipment and justified needs would be identified through information gathered during site-visits supported by user questionnaires.
5. Development of an accreditation process to offer recognition for participation and performance in iTAT. This could be Certificates of iTAT Completion and/or Certificates of iTAT Performance for individuals who participate and/or perform to high levels. We cannot however be considered to be 'authorising' staff as being assessors of retinopathy as we would not presume so to do nor do we have any clinical responsibility for staff in remote locations. Some pilot users have already indicated an interest in achieving formal qualifications in DR screening and hence access to call-off financial support to undertake and achieve one of the distance-learning qualifications through the GREG / University of Gloucestershire collaboration may be of tremendous benefit to them. Costs per person for the qualification range from GBP 1000 to 1500 (approx. USD 1500 to 2250), with a 50:50 split of revenue income between GREG as developers and deliverers of the learning and assessment and the University as awarders and validators. We already have a process in place to apply for bursary funding for those who can most benefit and further promulgate knowledge and best practice in their local setting. We would apply this review process to any such applications for financial support in this project.

Geographic focus of Preparing to Scale phase

- Continued support for the screening programmes in Bangladesh, Indonesia and Botswana who are at different stages of development maturity.
- Extending the project to Dar-es-Salam and Kilimanjaro regions in Tanzania as new sub-Saharan African locations.
- In conjunction with the Vision 2020 LINKS and DR.NET projects, extending to Uganda (Makerere and Mbarara), Zambia (Kitwe and Lusaka) and an additional location in Indonesia (Makassar).
- Vision 2020 LINKS Programme Manager Marcia Zondervan indicated that two sites in Malawi (Lilongwe and Blantyre) may benefit from support towards the end of 2016. Sites in Ghana, Kenya and Nigeria also indicated that they would significantly benefit from access to resources supported by this project, if that was possible (not in original application).
- Gloucestershire Hospitals provide TAT or iTAT systems to the national diabetic retinopathy screening programmes of England, Northern Ireland, Republic of Ireland and Wales, where participation is now a mandated activity. We also provide the iTAT system to sites/regions in China, Gibraltar, Italy, New Zealand and several other international locations and to a commercial provider in the USA. Students successfully completing a relevant qualification automatically have access to iTAT thereafter.
- The Certificate of Higher Education in DR Screening and subsidiaries, awarded through the University of Gloucestershire, has already been achieved by 58 staff since the initial October 2014 intake plus 35 are currently continuing their studies (including some in the September 2016 cohort who are supported by this project). They represent programmes in Australia, Bangladesh, China, Ghana, Hong Kong, Indonesia, Republic of Ireland, Italy, Jamaica, Kenya, Malawi, New Zealand, Nigeria, Portugal, Singapore and Zambia.

Priorities from previous reporting period

- Identification of key stakeholders and 'champions' in new partner countries and sites
- Translation into Bahasa Indonesian
- Collect questionnaires from new partner countries and sites
- Progress the developments to provide ETRS and AAO-style outputs from iTAT
- Identify complete list of IT needs for laptops and mobile (cell) phones
- Purchase first tranche of IT equipment
- Identify safe and secure locations in sites for storage of IT equipment and under whose control it will be stored and accessed

Progress against Project Objectives:

1. Provision of iTAT and e-learning

Introduction:

Test and Training (TAT), a web-served Quality Assurance and educational support system, is procured by Public Health England from Gloucestershire Hospitals NHS Foundation Trust (GHNHSFT or GHT) as the main QA tool to routinely monitor performance of over 1500 staff assessing diabetic retinopathy in the English NHS National Diabetic Eye Screening Programme (NHS-DESP). GHT are now in the 8th consecutive year of provision of TAT to NHS-DESP and it is now a mandated activity for all grading (assessment) staff. Each monthly on-line QA test set comprises 20 new cases. Users are required to assess the presence and severity of a range of features of diabetic retinopathy (a potentially blinding eye condition caused by diabetes) by signifying which features of retinopathy are present in the digital photographs presented to them. This involves merely ‘ticking’ those that are present on a web-served list. All test cases subsequently are available to registered users as open-access training sets, following the end of the month in which they appear as a test case. GHT has also developed an international version iTAT, available to other countries, which has been made available in this Project. The functionality of iTAT is almost identical to TAT and the cases are shared between the two systems – enabling direct comparisons to be made.

Progress in period:

1.1 Continued iTAT provision to existing 3 countries (i.e. Bangladesh, Botswana & Indonesia)

Months 1-18. No major changes in activity over those encountered during 1st 6-month period of the project. Bangladesh staff members continue to access and participate in iTAT. Indonesia has had very little activity with just one staff member participating twice during this period. Participation with iTAT from staff in Indonesia hopefully will improve dramatically as soon as the Bahasa Indonesian translation of iTAT is made available to them from April 2017. No activity from staff in Botswana during this period. We do not expect any activity yet on iTAT from staff from the new countries of Malawi, Tanzania or Zambia as they have yet to be scheduled to access iTAT as part of their studies. Activity and performance reports are provided at Appendix 1.

The mean performance scores (i.e. exactly matching the allocated NHS-DESP ‘R’ and ‘M’ grades on each case) for the staff from Bangladesh who completed the monthly iTAT sets in June to November 2016 compared very creditably with the staff of the English NHS-DESP programme who took the identical tests in those months.

	Bangladesh staff completing set (n)	Bangladesh mean score (%)	NHS-DESP mean score (%)
June 2016	10	82%	88%
July 2016	7	89%	92%
August 2016	6	83%	91%
September 2016	11	85%	91%
October 2016	9	88%	91%
November 2016	9	86%	94%

It must be noted that the vast majority of the 1500 NHS-DESP staff who routinely undertake monthly TAT sets are specialist highly experienced screener/graders of diabetic retinopathy, so would be expected to perform at a very high level.

Key Highlight 1: Staff from Bangladesh continue to participate in iTAT and perform very well compared to specialist NHS-DESP grading staff from England taking the same grading sets using TAT.

Staff who use iTAT under this project also have unrestricted access to training resource of previously assessed images, all of which benefit from having full feature lists and interactive lesion annotation enabled. This training resource comprises approximately 3 years of ‘monthly sets’ each of 20 individual cases (single eyes) showing different stages of diabetic retinopathy from none to very severe. Currently over 700 fully marked-up cases are available to users to access at any time. Users are not ‘assessed’ against training sets but on completion of a case they see their own performance metrics and, crucially, can access the individual annotated images to help with their continuous professional development and learning.

1.2 Additional site in Indonesia

Months 3-18. Ongoing but may redefine as prematurely Completed: We were provided with the contact details for two medical staff in Makassar (Dr Windy and Dr Suryanita); both of whom were reported as being interested in undertaking the qualification (see Section 5) and accessing iTAT. However, to date, nothing has come of this, which is disappointing. Our most recent attempt at contacting these two doctors was made in October 2016 but we still have received no reply to date. It is therefore unlikely that participation by this additional site in Indonesia will come to fruition during the remaining life of this project.

1.3 Develop and deliver e-learning material

Months 1-6. Completed: specialist training was provided to all sites during pilot phase and all participating staff have since had unrestricted access to the on-going collection of training cases in iTAT. Project staff Drs Moorman, Muqit and Peto and Mr Peter Blows each left targeted training materials in the sites they visited during the Pilot and early phase of this extension project, with no restrictions on the usage.

1.4 Provision to Tanzania, Zambia and Uganda

Months 4-18. On-going: Key contacts in Tanzania (2 sites), Uganda (2 sites) and Zambia (1 site) were identified and contacted. One member of staff from each of Tanzania (Kilimanjaro site) and Zambia is undertaking the qualifications (see Section 5), during which and for 1 year after they have access to iTAT. A further 4 members of staff from Tanzania (two each from Muhimbili and Mbeya) and two from Zambia (Kitwe) were identified as potentially due to register for the qualification and then to subsequently undertake iTAT but this has yet to come to fruition.

1.5 Provision to Malawi

Months 13-18. Actioned ahead of schedule: Three members of staff (two from Kamuzu Central Hospital plus one from Lions Sight Eye Frist Hospital) are currently undertaking the qualifications which will involve accessing iTAT as part of their training (see Section 5).

1.5a Provision to Ghana, Kenya and Nigeria

Outside of original project application: Following a request from Vision 2020 LINKS, 7 staff from three additional countries are currently undertaking the full qualification which will include iTAT access. These are Ghana (two staff from Korlebu Teaching Hospital), one from Kenya plus four from Nigeria (two each from University of Calabar and the Lagos University Teaching Hospital). Funding and support for these students were not included in the original application but we have taken the liberty to provisionally include those costs in this report (see Section 5, Financial Commentary and Letter of Variation).

1.6 Monitor iTAT results and provide feedback

Months 1-18. Current and on-track: provision and support has been seamless between Pilot and Preparing to Scale phases. Dr Muqit continues to provide periodic feedback and support to staff undertaking iTAT in Bangladesh. Due to little or no activity in Botswana or Indonesia, there is no current need for monitoring of results or feedback. This would be re-introduced following evidence of renewed activity on iTAT.

2. Translation of iTAT system and manuals

Introduction:

In order to increase acceptance of iTAT, GHT previously developed a Chinese translation of the pages and functionality (outside this project). This was very well received and significantly informed us about the necessary processes and procedures required to create translated versions within this project. In total, iTAT is now used in 19 countries including (currently) four countries with staff supported by this project. We now also have Spanish and Bahasa Indonesian versions, supported by this project.

Progress in period:

2.1 Bahasa Indonesian

Months 1-3. Substantially delayed but near completion: Due to no availability of translators at the time, the Spanish translation was prioritised over the Bahasa Indonesian version. However, Dr Bayu from Yogyakarta has since carried out translation of the iTAT site with just some final minor validation and testing to complete before roll-out. No further delays are anticipated.

Example screens from this translated version are shown at Appendix 2.

Key Highlight 2: Translation of the iTAT site to Bahasa Indonesian is complete, with final testing underway. It will be available during April 2017.

2.2 Spanish

Months 4-6. Completed ahead of schedule: Due to the lack of availability of Bahasa translator(s), the Spanish translation was prioritised over the Indonesian version. We identified this in the interim report 1.

2.3 Other languages (max 3 more)

Months 7-15. Unlikely to be required: We have not received any additional requests for translation of material or the iTAT site and hence this activity is unlikely to be further progressed within the project.

3. ETDRS- and AAO-style classification outputs from iTAT

Introduction:

In order to facilitate good communication and understanding between health-professionals (worldwide), it is often necessary to use common medical terminology and abbreviations. Terms and abbreviations must however be as precise and descriptive as possible, be understood by a wide professional audience and be in fairly common usage. Test and Training and the international version iTAT make use of NHS-DESP summarising algorithms which combine the various retinopathy features recorded by users into a few discrete 'levels' from R0 (no visible retinopathy), R1, R2 and R3 – the most severe level. The R-level severities are supplemented by recording of whether or not the retinopathy is affecting the central part of the vision (the 'macula'). Eyes without central involvement are M0, those with involvement are coded M1. The R and M level classifications were developed by a working group of experts and were published in 2003.¹ The Abstract for this publication is provided at Appendix 3. Many (but certainly not all) nations / programmes use this NHS-DESP classification scheme for summarising the presence and severity of retinopathy in their patients assessed during screening, so there is fairly wide understanding of it. There are however a few other classification schemes, most notably the much more complex ETDRS-derived scheme and the simpler clinical AAO/International classification scheme.

Progress in period:

3.1 Confer and confirm

Months 4-5. Completed. Information was collected, reviewed and informed the Project Team's decision-making processes.

3.2 Develop and validate algorithms

Months 6-7. Completed: Scope for development of this has been completed and agreed with iTAT web developer Netsima Ltd. Initial compatibility tables to convert from NHS-DESP style results (i.e. RxMx) to ETDRS- (i.e. 10, 20, 35 etc.) and AAO-style (i.e. "mild NPDR", "moderate NPDR" etc.) were developed and were provided to Netsima Ltd.

ETDRS and NHS-DESP level allocation schemes are quite similar, in that they are strictly based on the presence of almost the entire range of possible features of diabetic retinopathy. As each 'more severe' feature is detected, this is indicated by a higher number for the ETDRS severity level (ranging from 10 to 71+) or NHS-DESP scheme (R0 to R3). These two severity allocation schemes differ however in that ETDRS makes significant use of not only presence of a feature of DR, but also the concepts of severity and extent of some features (i.e. 'number of affected retinal fields') in order to assign an overall severity level for the eye. This is facilitated in ETDRS-type allocations by means of assessment of multiple imaging fields across the eye (historically seven retinal fields, taken as stereoscopic pairs). Such a complex imaging protocol is certainly not suitable for routine population-based

¹ *Grading and disease management in national screening for diabetic retinopathy in England and Wales. S Harding, R Greenwood, S Aldington, J Gibson, D Owens, R Taylor, E Kohner, P Scanlon, G Leese. The Diabetic Retinopathy Grading and Disease Management Working Party. Diabet. Med. 2003; 20: 965-971*

screening activities which use far fewer retinal fields (generally constrained to the ‘two images per eye’ used by NHS-DESP and now adopted by most programmes around the world), so direct mapping of every possible ETDRS level and sub-level is not actually possible when comparing it to the NHS-DESP grading.

The theoretical mapping between these two allocation schemes is shown at Appendix 4.

The AAO or International Classification scheme is less rigidly based on presence of individual features but is very reliant on counting of features when present, or assessing the extent of affected quadrants around the optic disc. It was essentially designed to facilitate standardised recording of severity of DR when carrying out clinical examinations using slit-lamp biomicroscopy or direct or indirect ophthalmoscopy; not in relation to retinal imaging. There are therefore no ‘standard fields’ of retinal images associated with that classification scheme, rendering it difficult to provide direct-equivalence mapping. Similarly, the schema used in NHS-DESP, adopted in many locations, declines from counting individual lesions or features as this is frequently considered to be highly inaccurate and unreproducible.

For these reasons, we have decided not to further progress the attempts to map the NHS-DESP style feature-based grading to the AAO/International Classification scheme within this project as this would potentially not be clinically accurate or particularly valuable.

Interim report 1 identified that we may be able to access the similar equivalence tables used in the commercial Ophthalmology EMR system Medisoft (Medisoft Ltd., Leeds UK) to potentially cross-validate the tables developed for iTAT. Unfortunately, for reasons outside our control, we have so far not been able so to do and hence this additional aspect (outside of the original application anyway) is unlikely to be progressed further.

3.3 Test and apply ETDRS (algorithms)

Months 8-10. Delayed but validation nearly completed: The mapping to ETDRS-style results reporting was completed and trials are underway to ascertain if our mapping algorithms are accurate, clinically appropriate and complete.

The initial mapping plan is shown at Appendix 4, rules of combination of individual retinal features at Appendix 5 and examples of ETDRS and NHS-DESP output (screenshots) for the same eye/selected features on one case are shown at Appendix 6.

Local programme managers will in future be able to allocate whether to get their Users’ results shown in NHS-DESP or ETDRS-style output; which will significantly appeal to many users around the world who may be somewhat unfamiliar with the English NHS-DESP severity notation.

This validation and testing is currently on-going with no expected further delays. Once complete, we will retrospectively apply this algorithm to all material in the iTAT training sets in order to generate the ETDRS-equivalent severity levels for the corresponding NHS-DESP outputs for all that training material. This will be a largely automated process, so will not have any significant associated delays or timescales, but will require checks and validations to ensure accuracy in all cases.

Key Highlight 3: Managing users of iTAT will soon be able to specify the format in which their staff can see the output results in either ETDRS- or NHS-DESP style.

3.4 Test and apply AAO (algorithms)

Months 11-14. Activity cancelled as being untenable for reasons given in section 3.2.

4. IT infrastructure and local IT equipment needs

Introduction:

The Pilot phase of this project identified that some partner sites had insufficient IT infrastructure or were without access to appropriate and adequate equipment to make effective use of iTAT, the learning / qualification environment and sharing of best practice. Robust internet access is essential for any use of iTAT and access to the web-served distance learning and qualifications. This was particularly evident in Botswana, somewhat less so in Bangladesh and not a particular reported problem in Indonesia. In this phase of the project we proposed providing some laptop computers ± discrete monitors plus mobile (cell) phones if these would help with internet access and would support staff having equitable access and making best use of their available time.

Progress in period:

4.1 Assess detailed needs with current partner sites

Month 1. Initially delayed but completed in June 2016: IT system and equipment needs identified by Bangladesh partners at NIO&H and CEITC through return of their Technology Questionnaires. Each site requested just a single laptop computer and a single mobile telephone. However, the two sites requested different mobile phone network providers, which could be problematic. To date it has proved impossible for us to enter into appropriate contracts with the two different local network providers (Grameenphone for NIO&H and Robi for CEITC).

No responses were received from Botswana or Indonesia, so this will not be progressed further during the life of this project.

4.2 Assess detailed needs new partners/sites

Months 4-6 and 12. Unsuccessful, so flagged as 'Completed': Unable to generate meaningful responses to requests for key staff who can identify technology requirements. This will not currently be progressed further.

4.3 Supply and support installation of required equipment

Months 2, 7-8 and 13. Probably flag as 'Completed' as further activity unlikely to be successful. Even though the two Bangladesh sites each indicated a desire to receive one laptop and mobile phone (with air-time contracts), it remains unclear how local access to this capital equipment would be made equitably available to all those who may require it under this project and, crucially, how potential inappropriate use of the equipment (particularly mobile phone call-time and inappropriate use of the laptop) could be prevented and, equally, how security of the equipment would be ensured for the duration of the project and beyond.

We consider therefore that there is no justification to purchase valuable equipment or enter contracts under this project if risks cannot be fully mitigated. We acknowledge that

we should have foreseen these potential risks at the start of the project. We can see no alternative but to cancel this aspect of the project as being unreasonably risky.

5. Accreditation and qualification

Introduction:

Participation in iTAT test sets needs to be recognised and accredited. Hence we provide individual iTAT users with periodic participation certificates as part of the project. Some staff in partner sites lack the necessary skills and knowledge to gain fully from participation in iTAT testing activities and in some cases there is also a clear need or desire for access to additional learning and/or formal qualification. During 2014 Gloucestershire Hospitals developed a suite of three qualifications in diabetic retinopathy screening, all validated and awarded by the University of Gloucestershire. They are under-graduate (Level 4) qualifications, in order to make them widely accessible and understandable, and are provided as distance-learning (on-line) and assessments. These qualifications are available to staff in partner sites through this project.

Progress in period:

5.1 Certification for iTAT users

Months 1, 7, 13 and 18. On-track: During May 2016 (end of project period 1) individual iTAT participation certificates from the early Users were issued to 19 staff from Bangladesh. Updated activity Certificates will continue to be provided periodically to all active Users throughout the remaining project duration and beyond.

5.2 Assess needs for formal qualifications

Months 1, 6 and 12. Back on-track and Completed with current partner sites: During May 2016 a questionnaire asking for feedback on the local site's anticipated need for formal qualifications was provided to all project partner locations.

These were returned, indicating that 7 people wished to undertake the full Certificate of Higher Education in DR Screening: two each from Bangladesh partner sites CEITC Chittagong and NIO&H Dhaka and one each from Indonesia, Malawi and Zambia. Two other students from Malawi (Kamuzu Central Hospital) registered to take the Grading Certificate and one from Kilimanjaro Tanzania to take the Imaging Certificate. They would all be registered on the course cohort with a start date of September 2016. This was tremendous news.

Unfortunately it was not possible to identify any of the (mainly ophthalmic nursing) staff in Botswana who would be able to undertake one of the formal qualifications. Reasons provided were: no protected time to study, lack of access to suitable internet connection, lack of access to a computer and lack of local support for prospective students.

5.3 Assess qualifications and bursary applications

Months 1, 7 and 13. Initially slightly delayed but now on-track: Applications for bursary funding support to undertake qualification were received from staff in Bangladesh, Ghana, Indonesia, Kenya, Malawi, Nigeria, Tanzania and Zambia – details in section 5.4.

5.4 Students undertake qualifications

Months 1, 7 and 13. Initially delayed but now on-track:

Students can chose the course of study/qualification they wish to undertake, delivered and assessed via web-based distance learning. The full Certificate of Higher Education in DR Screening comprises the 5 modules shown below, or they can take subsidiary University qualifications of either Certificate in Imaging (comprising modules 1, 2, 3 and 4) or Certificate in Grading (comprising modules 1, 2 and 5). Students are allowed 8 weeks for each Module and Modules are taken sequentially.

- Module 1 – An introduction to the study of diabetic retinopathy
- Module 2 – Diabetic eye screening: Programmes, processes and protocols
- Module 3 – Preparing the patient for diabetic eye screening
- Module 4 – Performing Retinal Screening
- Module 5 – Assessing Retinal Images

The Learning Outcomes for the modules are shown at Appendix 7.

The ten students from the 5 countries supported in this project successfully applied for bursary funding and were admitted to the qualifications as part of the total September 2016 cohort of total 23 students. The funding to support these students was already incorporated under Objective 5 of the previous Cash Request (August 2016) in the Interim Report following Period 1 of the Project.

The courses of study chosen and project funding is in the table below:

STUDENT INITIALS	EMPLOYER	COURSE	COST EACH (GBP)	NO. OF STUDENTS	FUNDING ALLOCATED (GBP)
JA & ZA	Chittagong Eye Infirmary & Training Complex, Bangladesh	Full Certificate	1,500	2	3,000
SI & MJ	National Institute of Ophthalmology, Bangladesh	Full Certificate	1,500	2	3,000
MBS	University of Gadjah Mada, Indonesia	Full Certificate	1,500	1	1,500
LM	Lions Sight First Eye Hospital, Malawi	Full Certificate	1,500	1	1,500
LL & VM	Kamuzu Central Hospital, Malawi	Grading Certificate	1,000	2	2,000
DG	Kilimanjaro Christian Medical Centre, Tanzania	Imaging Certificate	1,200	1	1,200
JN	University Teaching Hospital, Zambia	Full Certificate	1,500	1	1,500
TOTAL				10	£13,700
TOTAL COST / ALLOCATED					£13,700
US dollar equivalent					\$16,700

Progress of these 10 students has been excellent:

- The four students from Bangladesh and one each from Indonesia, Malawi and Zambia studying the full 5-module Certificate of Higher Education have all

successfully completed 3 of the 5 modules of this course on time and are undertaking the fourth module as scheduled.

- Student VM from Malawi on the 3-module Grading Certificate has recently successfully completed that course and will shortly be certificated. Many congratulations are due to him.
- The second student from Malawi (LL) on the Grading course successfully completed modules 1 and 2 but unfortunately failed the final exam on the last module. He has received detailed feedback from Steve Aldington and is now undertaking some remedial training and practice prior to re-taking the exam at a later date.
- Student DG from Tanzania, on the 4-module Imaging course, continues to progress well with studies, having completed 3 of the 4 modules, and is currently undertaking the final module of that qualification as scheduled.

Key Highlight 4: Ten students from the five original countries supported by this project are currently studying for the formal University qualifications and are progressing well. Seven further students from three new countries are also progressing well with their studies.

Key Highlight 5: Student VM from Malawi has recently completed the University of Gloucestershire’s Certificate in Grading and will shortly receive the Certificate from the University. VM will then transfer to being a supported user of iTAT.

An example of the University Certificate in Grading is shown at Appendix 8 (for a student outside this project).

There are also 7 students from 3 additional countries identified by Vision 2020 LINKS who are studying the full 5-module Certificate of Higher Education as part of the September 2016 cohort. This comprises 2 students from Ghana, one from Kenya plus 4 from Nigeria. However, as their countries were not included in the original SiB project application, project funding was not theoretically available to support their learning and qualification.

Gloucestershire Hospitals however considered their applications for bursary funding to be worthy and appropriate and hence decided to utilise an alternative source of funding, a small unrestricted educational grant from a bio-pharmaceutical company we have. The total cost for courses for these 7 students’ was £10,500 (US\$12,800):

STUDENT INITIALS	EMPLOYER	COURSE	COST EACH (GBP)	NO. OF STUDENTS	FUNDING ALLOCATED (GBP)
BA & ABM	Korlebu Teaching Hospital, Ghana	Full Certificate	1,500	2	3,000
RM	Kenyatta university Hospital, Nairobi, Kenya	Full Certificate	1,500	1	1,500
JA & KA	University of Calabar, Nigeria	Full Certificate	1,500	2	3,000
IE & JN	Lagos University teaching Hospital, Nigeria	Full Certificate	1,500	2	3,000
TOTAL				7	£10,500
TOTAL COST / ALLOCATED					£10,500
US dollar equivalent					\$12,800

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All these students continue to progress very well and have so far completed 3 of the 5 required modules alongside the other students in their cohort.

We are requesting, through a Letter of Variation, for approval to apply some otherwise unused project funding to these students.

All students, irrespective of their course of study, undertake Module 1 & 2. Full Certificate students take all five Modules, those on the Imaging course undertake Modules 1-4 inclusive and those on the Grading course undertake 1, 2 and 5.

Student Feedback from the entire group of 23 students on the September 2016 cohort for modules 1, 2 and 3 are attached as Appendices 9a, 9b and 9c respectively.

Summary of the feedback shows that Module 1 scored between 3.9 and 4.3 out of 5 for the specific questions, although the overall rating of the Module scored highly at 4.5 mean for the 23 students. Module 2 scored between 4.2 and 4.4 and Module 3 between 4.5 and 5.0.

Key Highlight 6: Student feedback shows a high rate of confidence and relevance in the teaching content, delivery methods and opportunities to achieve the Learning Outcomes.

In preparation for future student cohorts, we were initially informed by Vision 2020 LINKS that additional students would be registering for the February 2017 cohort. This would comprise four from Tanzania (two each from Muhimbili and Mbeya), four from Uganda (two each from Makerere and Mbarara), two from the 'new' site in Makassar Indonesia and two from Kitwe in Zambia. We were advised to make application to SiB/Standard Chartered for additional project funding to cover the costs associated with the studies for these 12 students.

However, as a result of poor responses received to multiple requests for applications from these prospective students, it was agreed with SiB/Standard Chartered in November 2016 that such an application for additional funding would not be appropriate. This has proven to be correct, as there still has been no successful application from any one of these prospective students/sites despite several requests. It is therefore not appropriate to request future funding for such students within the life of this project.

We do nevertheless have a large cohort of 48 new students for the February 2017 intake, comprising 32 from China, 8 from Italy, 5 from Republic of Ireland and 3 from Belize – all outside this project. This supports the future viability of GHT offering these qualifications.

6. Project management, data collection, interpretation, reports etc.

Introduction:

The project continues to be managed by Gloucestershire Hospitals UK with no staff changes or significant problems. Our project partners in the UK include Moorfields Eye Hospital London (Dr Muqit), Radcliffe Infirmary Oxford and Addenbrookes Cambridge (Dr Moorman) and now Queen's University Belfast (Professor Peto and Mr Blows moved from Moorfields to Belfast late 2016). Most project milestones have been delivered on-time and within budget, although there have been a few delays to some 'key pathway' items which have caused some knock-on delays. These are all now back on-track and require no remedial action.

Progress in period:

6.1 Project management and oversight

Months 1 - 18. On-track: Oversight of the project by Professor Peter Scanlon and routine management of it by Steve Aldington continues successfully. Major decisions are made only after group discussion between the applicants (Scanlon, Aldington, Moorman, Peto, Muqit, Blows and George). Provision of iTAT is supported by Gwen George and Paul Dimmock of GHT and with Netsima Ltd, the web-content provider. We are particularly grateful to the Gloucestershire Retinal Education Group qualifications team (Clare Waite, Sam Flynn and Danielle Meeks) who expertly managed all aspects of applications and progress from students supported in this project. The central project team remain grateful to all the colleagues in many locations who continue to provide their time and expertise to support the aims of this project.

6.2 Questionnaires, data collection and interpretation

Months 1-3, 8-10 and 15-18. Delayed but now on-track: Technology Questionnaires were developed and distributed to the two sites in Bangladesh during May 2016 and were returned. Technology Questionnaires were sent to Botswana and Indonesia but have not yet been returned. Technology Questionnaires have not yet been provided to new sites.

6.3 Final report submission and dissemination at meetings, publications

Months 17-18. On-track:

- Professor Peter Scanlon provided an overview of the project to the SiB/Standard Chartered Programme Committee meeting in London on 14th June 2016
- Steve Aldington presented the project as an oral to the EASDec annual meeting in Manchester 23-25th June 2016
- Steve Aldington participated in the SiB Africa webinar on 6th July 2016
- Dr Mahi Muqit with support from Professor Tunde Peto and Dr Consuela Moorman presented the project at the 10th GA of the IAPB in Durban, 27-30th October 2016
- Professor Peter Scanlon has presented the project during 2016 in invited/guest presentations at locations including China, Japan and South America
- Steve Aldington has been invited to deliver the 2017 Eva Kohner lecture at the EASDec meeting in Budapest (23-25 May) and will report on project activity as an integral part of that presentation
- We anticipate no delays in submitting final reports at the due time

Financial commentary

- The project at end of month 12 is underspent by 18% with a projection of a possible 32% underspend by end of month 18
- Project Objective 1 (Provision of iTAT and e-learning) is marginally (8%) underspent at this point. Most individual project lines were on-budget, except 1b (26% underspent) as Users did not need the full support expected and 1c, significantly (80%) underspent as no additional sites have yet required implementation and support. There was a 12% overspend on content changes item 1e
- Project Objective 2 (Translation of iTAT system) is 47% underspent and will not be otherwise utilised for this activity. Translation and adaption of system for Spanish (item 2.1) and Bahasa Indonesian (item 2.2) were 32% and 34% overspent respectively, however allowance for additional translations (item 2.3) has not been used, so that item is 100% underspent
- Project Objective 3 (ETDRS and AAO- outputs from iTAT) is on-budget (+1% variance). There was 15% underspend on early discussions (item 3.1) but 88% overspend on developing and validating the algorithms (item 3.2) as this item took longer and was more complex than originally estimated. Application of the ETDRS-style output (item 3.3) has seen a 10% underspend, partially due to the work done on item 3.2. However, the AAO-style output (item 3.4) was not developed further and will not be applied, so there is a 100% underspend on that item line
- Project Objective 4 (to supply IT and telecoms equipment) is 92% underspent with only \$2,227 used from over \$27,000 budget. Assessment of user needs identified that Bangladesh (who provided responses) asked for just 2 laptops and 2 mobile phones, but two different network providers were required. No responses were otherwise received from project partner sites. A subsequent review by the project team identified that we could not be sure that IT or telecoms equipment supplied under this project would be assuredly used mainly for project-related purposes, would be equitably accessible to all those who may potentially benefit from it and could be guaranteed to be safely and securely stored. Regrettably, we therefore decided that this aspect of the project was not justifiably progressed further
- Project Objective 5 (Accreditation and qualification) is on-budget with +2% variance. The minor budget item 5a to develop Certificates of Participation and Performance was underspent by 37%. Item 5b, assessing the need for formal qualifications, was on-budget. The project application estimated a requirement for bursary funding support for 5 students to take the Full Certificate (item 5c), 10 doing the Screening Certificate (item 5d) plus 10 doing the Grading Certificate (item 5e). However, we received applications to do the Full Certificate from 7 students from Bangladesh, Indonesia and Zambia, one from Tanzania to do the Screening course and two from Malawi to do the Grading course on the September 2016 cohort. Funding for these 10 students was included in the first interim report and cash request 2, as they had already registered their interest at the time. We subsequently received applications for 7 further students to do the Full Certificate from three additional countries supported by Vision 2020 NET – Ghana, Kenya and Nigeria. We are therefore requesting permission to apply project funds to support these 7 students, all of whom are also on the September 2016 cohort. All are progressing well with their studies. Costs for these 7 students are included in this claim under item 5c and a Letter of Variation is submitted. No applications were received in time for students to enrol in the February 2017 cohort
- Project Objective 6 (Project Management) is currently 18% underspent but activity is progressing well and no actions are required.

Key risks or concerns

- Project risks:* We remain concerned that users in Botswana and Indonesia are not able to routinely utilise iTAT and have not taken up the qualifications (except the one student from Indonesia). Without protected time to study or to do the iTAT tests, things are unlikely to improve in this regard. There has however been take-up of the qualifications (and in time, iTAT) from staff in some of the new countries and sites, which is very reassuring. User involvement and participation remain dependent on identifying at least some protected time, sufficient access to resources and key support from local and remote clinical and administrative and clinical ‘champions’. However, as people benefit from the learning and experience gained through this project, they in turn can help and support others and the benefits of iTAT participation and engagement with the learning and qualification processes should be sustainable into the future.
- Product risks:* We have not encountered nor do we envisage any significant product risks with TAT, iTAT or the qualifications. They all remain the intellectual property and under the direct control of Gloucestershire Hospitals NHS Foundation Trust. The Hospital Trust has a long-established working relationship with Netsima Limited (our web-content provider) and the two organisations operate under formal contracts. The TAT system has been provided to the English NHS-DESP for 7 years and is now the *de facto* standard for measuring grading staff performance in that, the world’s largest systematic national DR screening programme (2 million people were screened in England in 2016). Provision of TAT to NHS-DESP is procured by Public Health England (PHE) and is overseen by an independent Advisory Board appointed by PHE. Similarly, iTAT has been used by a number of countries for over 3 years and has become the standard against which graders in those countries / programmes are measured. Developments and enhancements implemented in TAT are generally rolled into iTAT, at little or no cost. The qualifications are validated and awarded by a respected long-established UK University and our processes are approved as meeting or exceeding the standards set by the UK education regulator OFQUAL. Each of these aspects builds and benefits from the other to reduce product risks.
- External risks:* This project is controlled by the Gloucestershire Retinal Education Group of Gloucestershire Hospitals’ Department of Ophthalmology. The Group, headed by Professor Peter Scanlon, developed and provides TAT and iTAT. It has a long history of developing and providing educational content and learning. In addition to the University Cert HE in DRS qualifications, we also offer a number of other courses and qualifications with the University of Gloucestershire or with other awarding bodies. The Education Group are financially viable and somewhat independent (i.e. largely unaffected by Department or Trust finances as a whole) and generate income to support our operations in order to minimise financial risks. The biggest external risks facing our project partners are lack of protected time in which to undertake learning, qualification and participation in iTAT; poor internet access speed and in some places a lack of access to IT resources. We are continuing to investigate the possibility of further development of off-line operations for some aspects, but it is unlikely that these could be achieved within the scope of this current project, within budget and currently remaining timescales.

Priorities for the next reporting period

- Ensure continued support for the active sites (particularly in Bangladesh) and see what can be done to help the staff in Indonesia and potentially Botswana to participate more fully
- Support and encourage the staff in Indonesia to re-engage and participate in iTAT, now that the Bahasa Indonesian translation is completed
- Ensure the staff from new sites in Malawi, Tanzania and Zambia are appropriately supported as they undertake the qualifications and, in time, access and use iTAT
- Finalise the roll-out of the live ETDRS-style reporting and obtain iTAT user feedback on its value and usefulness
- Validate the ETDRS-style output format to the material in the Training sets
- Discuss with SiB and the Bank the possibility of a no-cost 6-month extension to the project to allow time for Indonesian staff to make use of the translated version of iTAT and for the relevant staff to access iTAT after completing their qualifications
- Continue to externally promote the project and the support of SiB/Standard Chartered
- Consider the lessons learnt within the project as key outputs for the Final Report

Report prepared, amended and submitted by
Steve Aldington, Project Manager
GHNHSFT
April 2017

Appendices:

Appendix 1. iTAT participation June to November 2016

Attempts Summary: Bangladesh June to November 2016							
Date started	Grader	Programme	Completed in period	No. screens recorded	Agreement with guide grade	%	Period
17/06/2016	4503	Bangladesh	Yes	20	34 / 40	85%	June 2016
07/06/2016	4504	Bangladesh	Yes	20	31 / 40	78%	June 2016
13/06/2016	4519	Bangladesh	Yes	20	32 / 40	80%	June 2016
12/06/2016	4522	Bangladesh	Yes	20	31 / 40	78%	June 2016
13/06/2016	4523	Bangladesh	Yes	20	36 / 40	90%	June 2016
12/06/2016	4524	Bangladesh	Yes	20	32 / 40	80%	June 2016
12/06/2016	4525	Bangladesh	Yes	20	33 / 40	82%	June 2016
12/06/2016	4526	Bangladesh	Yes	20	35 / 40	88%	June 2016
08/06/2016	4533	Bangladesh	Yes	20	31 / 40	78%	June 2016
14/06/2016	4612	Bangladesh	Yes	20	31 / 40	78%	June 2016
14/06/2016	4617	Bangladesh	No	16	19 / 32	59%	June 2016
					Mean	82%	
15/07/2016	4503	Bangladesh	Yes	20	36 / 40	90%	July 2016
11/07/2016	4504	Bangladesh	Yes	20	38 / 40	95%	July 2016
10/07/2016	4514	Bangladesh	Yes	20	37 / 40	92%	July 2016
13/07/2016	4524	Bangladesh	Yes	20	34 / 40	85%	July 2016
31/07/2016	4525	Bangladesh	Yes	20	35 / 40	88%	July 2016
13/07/2016	4526	Bangladesh	Yes	20	39 / 40	98%	July 2016
11/07/2016	4533	Bangladesh	Yes	20	29 / 40	72%	July 2016
					Mean	89%	
21/08/2016	4503	Bangladesh	Yes	20	32 / 40	80%	August 2016

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30/08/2016	4504	Bangladesh	Yes	20	37 / 40	92%	August 2016
22/08/2016	4508	Bangladesh	Yes	20	26 / 40	65%	August 2016
16/08/2016	4514	Bangladesh	Yes	20	35 / 40	88%	August 2016
19/08/2016	4533	Bangladesh	Yes	20	34 / 40	85%	August 2016
					Mean	83%	
09/09/2016	4503	Bangladesh	Yes	20	32 / 40	80%	September 2016
19/09/2016	4504	Bangladesh	Yes	20	37 / 40	92%	September 2016
08/09/2016	4508	Bangladesh	Yes	20	31 / 40	78%	September 2016
29/09/2016	4514	Bangladesh	Yes	20	36 / 40	90%	September 2016
29/09/2016	4519	Bangladesh	Yes	20	36 / 40	90%	September 2016
29/09/2016	4522	Bangladesh	Yes	20	33 / 40	82%	September 2016
29/09/2016	4523	Bangladesh	Yes	20	33 / 40	82%	September 2016
25/09/2016	4524	Bangladesh	Yes	20	30 / 40	75%	September 2016
27/09/2016	4525	Bangladesh	Yes	20	34 / 40	85%	September 2016
29/09/2016	4527	Bangladesh	Yes	20	37 / 40	92%	September 2016
23/09/2016	4533	Bangladesh	Yes	20	34 / 40	85%	September 2016
					Mean	85%	
16/10/2016	4503	Bangladesh	Yes	20	37 / 40	92%	October 2016
20/10/2016	4504	Bangladesh	Yes	20	36 / 40	90%	October 2016
09/10/2016	4508	Bangladesh	Yes	20	30 / 40	75%	October 2016
30/10/2016	4514	Bangladesh	Yes	20	38 / 40	95%	October 2016
31/10/2016	4523	Bangladesh	Yes	20	35 / 40	88%	October 2016
30/10/2016	4524	Bangladesh	Yes	20	35 / 40	88%	October 2016
30/10/2016	4525	Bangladesh	Yes	20	35 / 40	88%	October 2016
13/10/2016	4526	Bangladesh	Yes	20	35 / 40	88%	October 2016
14/10/2016	4533	Bangladesh	Yes	20	37 / 40	92%	October 2016
					Mean	88%	

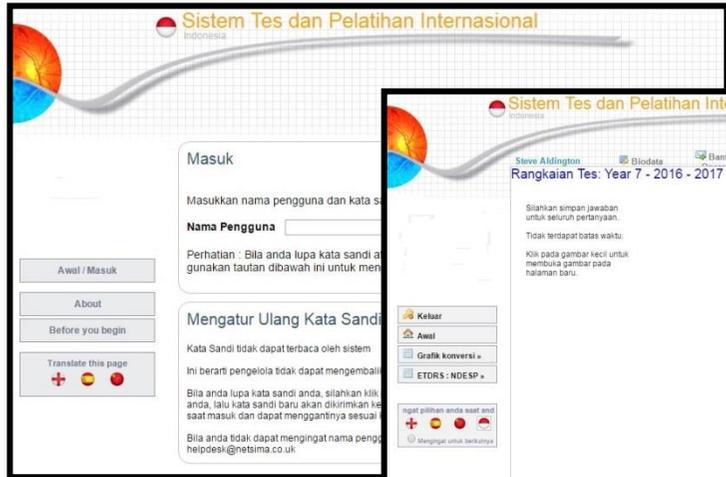
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20/11/2016	4503	Bangladesh	Yes	20	35 / 40	88%	November 2016
20/11/2016	4504	Bangladesh	Yes	20	38 / 40	95%	November 2016
09/11/2016	4508	Bangladesh	Yes	20	36 / 40	90%	November 2016
15/11/2016	4522	Bangladesh	Yes	20	32 / 40	80%	November 2016
15/11/2016	4523	Bangladesh	Yes	20	35 / 40	88%	November 2016
14/11/2016	4524	Bangladesh	Yes	20	35 / 40	88%	November 2016
22/11/2016	4525	Bangladesh	Yes	20	32 / 40	80%	November 2016
10/11/2016	4526	Bangladesh	Yes	20	32 / 40	80%	November 2016
11/11/2016	4533	Bangladesh	Yes	20	34 / 40	85%	November 2016
					Mean	86%	

Attempts Summary: Indonesia June to November 2016							
Date started	Grader	Programme	Completed in period	No. screens recorded	Agreement with guide grade	%	Period
08/06/2016	4475	Indonesia	No	7	9/14	64%	June 2016
05/10/2016	4475	Indonesia	No	7	11/14	79%	October 2016

Attempts Summary: Botswana June to November 2016: Staff in Botswana had no active participation during the period to report

Log-in screen



Grading screen

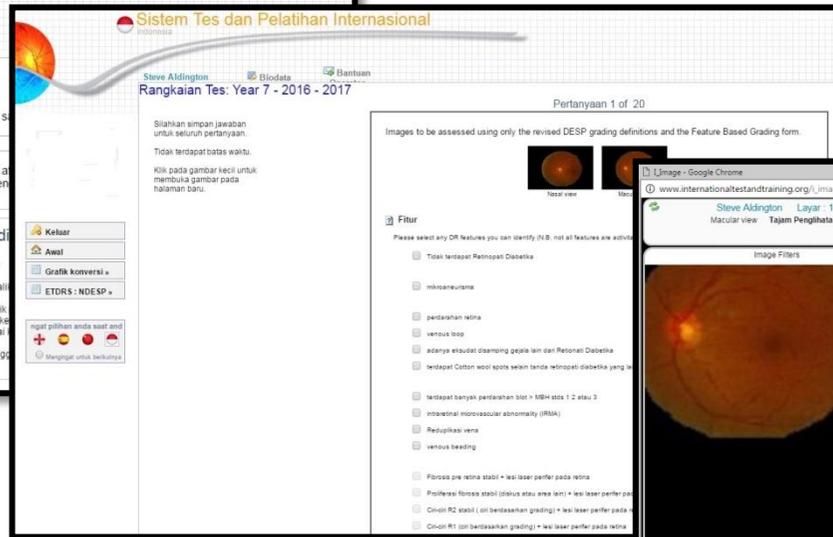
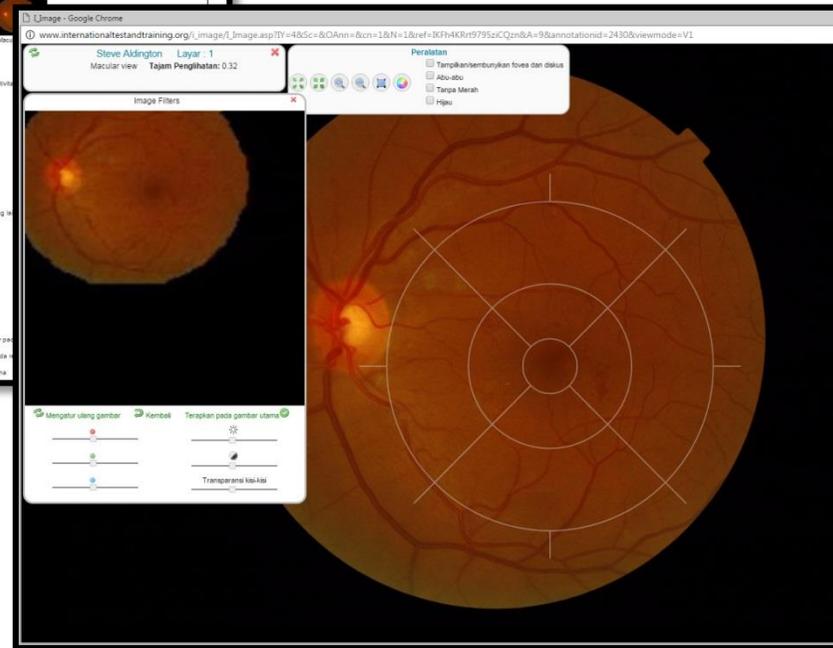


Image viewer screen



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Appendix 3. NHS-DESP severity classification scheme publication (Abstract)

Grading and disease management in national screening for diabetic retinopathy in England and Wales

S Harding, R Greenwood, S Aldington, J Gibson, D Owens, R Taylor, E Kohner, P Scanlon and G Leese

The Diabetic Retinopathy Grading and Disease Management Working Party

Abstract

Aims

A National Screening Programme for diabetic eye disease in the UK is in development. We propose a grading and early disease management protocol to detect sight-threatening diabetic retinopathy and any retinopathy, which will allow precise quality assurance at all steps while minimizing false-positive referral to the hospital eye service.

Methods

Expert panel structured discussions between 2000 and 2002 with review of existing evidence and grading classifications.

Proposals

Principles of the protocol include: separate grading of retinopathy and maculopathy, minimum number of steps, compatible with central monitoring, expandable for established more complex systems and for research, no lesion counting, no 'questionable' lesions, attempt to detect focal exudative, diffuse and ischaemic maculopathy and fast track referral from primary or secondary graders. Sight-threatening diabetic retinopathy is defined as: pre-proliferative retinopathy or worse, sight-threatening maculopathy and/or the presence of photocoagulation. In the centrally reported minimum data set retinopathy is graded into four levels: none (R0), background (R1), pre-proliferative (R2), proliferative (R3). Maculopathy and photocoagulation are graded as absent (M0, P0) or present (M1, P1).

Discussion

The protocol developed by the Diabetic Retinopathy Grading and Disease Management Working Party represents a new consensus upon which national guidelines can be based leading to the introduction of quality-assured screening for people with diabetes.

Diabet. Med. 2003; 20: 965–971

ETDRS final Retinopathy Severity Scale	ETDRS (Final) Grade	ETDRS Lesion / Level definition	Mapping Possible?	Maps to which DESP feature(s)	English DESP levels and Description
No apparent retinopathy	10	DR absent	YES, EXACT	No DR	R0 No diabetic retinopathy
	14, 15	DR questionable	NO	(ignore)	
Mild NPDR	20	Microaneurysms only	YES, EXACT	Microaneurysm(s)	R1 Non-referable diabetic retinopathy
	35A	Venous loops \geq definite in 1 field	YES, EXACT	Venous loop AND Microaneurysm or retinal haemorrhage	
	35B	SE, IRMA, or VB questionable	NO	(ignore)	
	35C	Retinal haemorrhage(s) present	YES, EXACT	Retinal haemorrhage(s)	
	35D	HE \geq definite in 1 field	YES, but needs other DR	Any exudate AND Microaneurysm or retinal haemorrhage	
	35E	SE \geq definite in 1 field	YES, but needs other DR	Any number of CWS AND Microaneurysm or retinal haemorrhage	
Moderate NPDR	43A	H/Ma moderate in 4-5 fields or severe in 1 field	YES, EQUIVALENT	Multiple blot haemorrhage > MBH 1, 2 or 3	R2 Referable non-proliferative diabetic retinopathy
	43B	IRMA definite in 1-3 fields	YES, EXACT	Intraretinal microvascular abnormality (IRMA)	
Moderately severe NPDR	47A	H/Ma moderate in 4-5 fields or severe in 1 field and IRMA definite in 1-3 fields	YES, EQUIVALENT	Multiple blot haemorrhage > MBH 1, 2 or 3 AND Intraretinal microvascular abnormality (IRMA)	R2 Referable non-proliferative diabetic retinopathy
	47B	IRMA in 4-5 fields	NO	(no equivalent severity)	
	47C	HMA severe in 2-3 fields	NO	(no equivalent severity)	
	47D	VB definite in 1 field	YES, EXACT	Venous beading	
Severe NPDR	53A	\geq 2 of the 3 level 47 characteristics	YES PARTIAL: 47A + 47D, but otherwise NO	Multiple blot haemorrhage > MBH 1, 2 or 3 AND Venous beading	R2 Referable non-proliferative diabetic retinopathy
	53B	H/Ma severe in 4-5 fields	NO	(no equivalent severity)	
	53C	IRMA \geq moderate in 1 field	NO	(no equivalent severity)	

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	53D	VB \geq definite in 2-3 fields	NO	(no equivalent severity)	
Mild PDR	61A	FPD or FPE present with NVD absent	YES, EXACT	Pre-retinal fibrosis BUT NVE and NVD absent	R3 Referable proliferative diabetic retinopathy
	61B	NVE = definite	YES, EXACT	NVE	
Moderate PDR	65A	NVE \geq moderate in 1 field or definite NVD with VH and PRH absent or questionable	YES PARTIAL: if NVD present but otherwise NO	NVD \pm NVE BUT Pre-retinal or vitreous haemorrhage absent	
	65B	VH or PRH definite and NVE < moderate in 1 field and NVD absent	YES, EQUIVALENT	Pre-retinal or vitreous haemorrhage AND NVE BUT NVD absent	
High risk PDR	71A	VH or PRH \geq moderate in 1 field	NO	(no equivalent severity)	
	71B	NVE \geq moderate in 1 field and VH or PRH definite in 1 field	NO	(no equivalent severity)	
	71C	NVD = 2 and VH or PRH definite in 1 field	YES, EQUIVALENT	Pre-retinal or vitreous haemorrhage AND NVD	
	71D	NVD \geq moderate	NO	(no equivalent severity)	
High risk PDR	75	NVD \geq moderate and definite VH or PRH	NO	(no equivalent severity)	
Advanced PDR	81	Retina obscured due to VH or PRH	YES, EQUIVALENT	Pre-retinal or vitreous haemorrhage AND No other DR features recorded (i.e. retina obscured)	

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Appendix 5. NHS-DESP to ETDRS rules of feature combination

Features present -

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	N-DESP	ETDRS
NONE															R0	10
	MA														R1	20
	MA	RH													R1	35C
	MA	±RH	VL												R1	35A
	MA	±RH	±VL	HE											R1	35D
	MA	±RH	±VL	±HE	CWS										R1	35E
	MA	±RH	±VL	±HE	±CWS	MBH									R2	43A
	MA	±RH	±VL	±HE	±CWS		IRMA								R2	43B
	MA	±RH	±VL	±HE	±CWS	+MBH	IRMA								R2	47A
	MA	±RH	±VL					VREDUP							R2	35A
	MA	±RH	±VL	±HE	±CWS		±IRMA	±VREDUP	VB						R2	47D
	MA	±RH	±VL	±HE	±CWS	+MBH	±IRMA	±VREDUP	VB						R2	(53A+)
	MA									NVE					R3	(61B+)
	MA										NVD				R3	(65A+)
	MA											PRH / VH			R3	(65B+)
	MA										+NVD	PRH / VH			R3	(71C+)
	MA												PRF		R3	61A
	MA													TRD	R3	(no match)

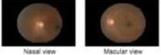
Where:

MA = microaneurysm, RH = retinal haemorrhage, VL = venous loop, HE = hard exudate, CWS = cotton wool spot, MBH = multiple blot haemorrhages, IRMA = intra-retinal microvascular abnormality, VREDUP = venous reduplication, VB = venous beading, NVE = new vessels elsewhere, NVD = new vessels of the disc, PRH = pre-retinal haemorrhage, VH = vitreous haemorrhage, PRF = pre-retinal fibrosis, TRD = Tractional retinal detachment

Appendix 6. NHS-DESP and ETDRS outputs for the same iTAT case

Question 1 of 20

Images to be assessed using only the revised DESP grading definitions and the Feature Based Grading form.



Features

Please select any DR features you can identify (N.B. not all features are activated but all are visible).

- No DR
- microaneurysm(s) *
- retinal haemorrhage(s)
 - venous loop
 - any exudate in the presence of other features of DR
 - any number of cotton wool spots (CWS) in the presence of other features of DR
- multiple blot haemorrhages + MBH size 1 2 or 3
- intraretinal microvascular abnormality (IRMA)
 - venous reduplication
 - venous beading
- Stable pre-retinal fibrosis + peripheral retinal scatter laser
- Stable fibrous proliferation (disc or elsewhere) + peripheral retinal scatter laser
- Stable R2 features (from feature based grading) + peripheral retinal scatter laser
- R1 features (from feature based grading) + peripheral retina scatter laser
- new vessels elsewhere (NVE)
- new vessels on disc (NVD)
- pre-retinal or vitreous haemorrhage
- pre-retinal fibrosis
- tractional retinal detachment
- Reactivation in a previous stable R3s eye
- No referable Maculopathy
 - any microaneurysm or haemorrhage within 1 disc diameter (1DD) of the centre of the fovea if associated with a best VA of $\leq 6/12$ where the cause of the reduced vision is known and not diabetic macular oedema
 - exudate within 1DD of the centre of the fovea
 - group of exudates $\leq 1/2$ DA within the macula
 - any microaneurysm or haemorrhage within 1DD of the centre of the fovea only if associated with a best VA of $\leq 6/12$ (0.30 logMAR) (if no stereo)
 - retinal thickening within 1DD of the centre of the fovea (if stereo available)
- No evidence of previous photocoagulation
- focal/grid to macula or peripheral scatter

Comments

Record my responses » End my set for now »

NHS-DESP : R2M0

Question 1 of 20

Images to be assessed using only the revised DESP grading definitions and the Feature Based Grading form.



Features

Please select any DR features you can identify (N.B. not all features are activated but all are visible).

- No DR
- microaneurysm(s) *
- retinal haemorrhage(s)
 - venous loop
 - any exudate in the presence of other features of DR
 - any number of cotton wool spots (CWS) in the presence of other features of DR
- multiple blot haemorrhages + MBH size 1 2 or 3
- intraretinal microvascular abnormality (IRMA)
 - venous reduplication
 - venous beading
- Stable pre-retinal fibrosis + peripheral retinal scatter laser
- Stable fibrous proliferation (disc or elsewhere) + peripheral retinal scatter laser
- Stable R2 features (from feature based grading) + peripheral retinal scatter laser
- R1 features (from feature based grading) + peripheral retina scatter laser
- new vessels elsewhere (NVE)
- new vessels on disc (NVD)
- pre-retinal or vitreous haemorrhage
- pre-retinal fibrosis
- tractional retinal detachment
- Reactivation in a previous stable R3s eye
- No referable Maculopathy
 - any microaneurysm or haemorrhage within 1 disc diameter (1DD) of the centre of the fovea if associated with a best VA of $\leq 6/12$ where the cause of the reduced vision is known and not diabetic macular oedema
 - exudate within 1DD of the centre of the fovea
 - group of exudates $\leq 1/2$ DA within the macula
 - any microaneurysm or haemorrhage within 1DD of the centre of the fovea only if associated with a best VA of $\leq 6/12$ (0.30 logMAR) (if no stereo)
 - retinal thickening within 1DD of the centre of the fovea (if stereo available)
- No evidence of previous photocoagulation
- focal/grid to macula or peripheral scatter

Comments

Record my responses » End my set for now »

ETDRS : 43+

Appendix 7. Cert HE in DRS Screening – Learning Outcomes

Module 1 – An introduction to the study of diabetic retinopathy

Learning outcomes:

A student passing this module should be able to:

1. Demonstrate an understanding of the methods of study required to complete the qualification
2. Identify sources of information and evidence appropriate for study of this programme.
3. Demonstrate skills which enable them to become more self-motivated, independent, and effective learners
4. Define the different types of Diabetes, identify the risk factors associated with each and describe the treatments currently available
5. Demonstrate understanding of microvascular and macrovascular complications and how they affect the patient
6. Describe the modifiable and non-modifiable risk factors for diabetic retinopathy progression and possible development of sight threatening diabetic retinopathy

Module 2 – Diabetic eye screening: Programmes, processes and protocols

Learning outcomes:

A student passing this module should be able to:

1. Identify the WHO principles that apply to screening for sight threatening diabetic retinopathy
2. Identify the limits that apply to a screening programme for Diabetic Retinopathy.
3. Recognise the importance of population coverage in a screening programme for sight threatening diabetic retinopathy
4. Provide details of the different technologies that are commonly used in population-based diabetic retinopathy screening and describe the advantages and disadvantages of dilation and the different number of fields
5. Identify reasons why people do or do not attend for Diabetic Retinopathy Screening
6. Assess the importance of the information management systems used within screening programmes

Module 3 – Preparing the patient for diabetic eye screening

Learning outcomes:

A student passing this module should be able to:

1. Give details of the important stages in preparing the equipment for a retinal screening encounter
2. Demonstrate an understanding of the importance of retinal screening for a person with diabetes.
3. Describe the patients journey through the entire screening process
4. Compare and contrast the different charts and systems used to measure distance visual acuity (e.g. Snellen, Decimal, log MAR and those for illiterate patients)
5. Demonstrate the importance of adequate chart illumination as it applies to (supervised) visual acuity measurement in 10 patients within their own screening programme
6. Demonstrate understanding of local consent procedures for screening

Module 4 – Performing Retinal Screening

Learning outcomes:

A student passing this module should be able to:

1. Locate relevant major anatomical structure on a diagram of the eye to demonstrate their understanding of the basic ocular anatomy.
2. Identify the lesions commonly associated with each broad category of increasingly severe diabetic retinopathy
3. Demonstrate understanding of the mechanism of action of mydriatic drops commonly used in screening programmes
4. Identify the side effects of mydriatic drops and describe the action to be taken should side effects occur
5. Demonstrate the ability to instil drops, develop and maintain accurate records for patients within their own screening programme where drops are used for dilation
6. Demonstrate safe handling and operation of the screening camera to obtain good quality images of patients using relevant screening methodology

Module 5 – Assessing Retinal Images

Learning outcomes:

A student passing this module should be able to:

1. Provide evidence of their current knowledge and ability and reflect on areas for further development and training.
2. Competently grade a series of images of the retina to demonstrate an ability to distinguish the presence or absence of lesions of diabetic retinopathy.
3. Competently grade a series of images of the retina to demonstrate an ability to distinguish the severity of diabetic retinopathy
4. Competently grade a series of images of the retina to demonstrate an ability to distinguish other abnormalities of the retina and blood vessels of the retina that may be seen on diabetic retinopathy screening images.
5. Identify other pathology that commonly affects the retina and/or blood vessels that may be seen on diabetic retinopathy screening images and show an understanding of the risk factors associated with them

Appendix 8. Example Certification by the University of Gloucestershire



Appendix 9a. Student feedback – Sept 2016 cohort, Module 1

Module code and name: HS4301 – An Introduction to the Study of Diabetic Retinopathy

Module run: September 2016

Number of students registering for module: 27

No of students completing the module	27
No of students passing the module	25
No of non-submissions	0
No of students with current Mit Circs	0
No & reason for withdrawals	0

How was final module evaluation undertaken? Online

Number of student’s evaluation form responses: 23

Who conducted the evaluation? DRS Administration (Gloucestershire Hospitals)

Previous Year’s Action Plan

(To be copied from previous year’s proforma and update on progress shown)

Action Required

Completed

Item No.	Issue Raised during Evaluation	Action to be taken	Staff involved / Resources	Date	Achieved
	(none)				

Evaluation Outcomes:

Please rate the following aspects of the course according to the key provided

Navigation of the virtual learning environment was:	Very easy	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	Very poor
		7	6	10	0	0	

Information provided & documentation before the start of the course was:	Very easy	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	Very poor
		5	12	5	1	0	

Communication with members of the course team was:	Very easy & efficient	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	Very poor & ineffective
		7	9	6	1	0	

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Teaching & Learning Resources provided for this Module were:	Helpful & Informed learning	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	Not appropriate
		6	12	4	1	0	

Comments:

Student 1 – “Very broad”

The Study tasks provided for this Module were:	Helpful & Informed learning	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	Not appropriate
		11	7	5	0	0	

The instructions provided for the end of Module exam were:	Very helpful	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	Not helpful
		11	7	4	0	0	

Were you able to access the books & Internet sites provided in the Further Learning & Additional Resources Section?	<u>All</u>	<u>Some</u>	<u>None</u>
	7	15	1

Did this Module contain sufficient theoretical background information to allow you to achieve the learning outcomes?	<u>Yes</u>	<u>No</u>
	22	1

Overall I would rate the Module as:	Excellent	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	Poor
		13	9	1	0	0	

Action required arising from 2015-2016 – to transfer to Course Action Plan for AMR

Item No.	Issue Raised during Evaluation	Action to be taken	Staff involved / Resources	Date	Achieved
	(none)				

SiB Innovation Fund

Appendix 9b. Student feedback – Sept 2016 cohort, Module 2

Module code and name: HS4302 Diabetic eye screening: Programmes, processes & protocols

Module run November 2016

Number of students registering for module: 23

No of students completing the module	23
No of students passing the module	21
No of non-submissions	0
No of students with current Mit Circs	1
No & reason for withdrawals	0

How was final module evaluation undertaken? Online

Number of student’s evaluation form responses: 19

Who conducted the evaluation? DRS Administration (Gloucestershire Hospitals)

Previous Year’s Action Plan

(To be copied from previous year’s proforma and up date on progress shown)

Action Required

Completed

Item No.	Issue Raised during Evaluation	Action to be taken	Staff involved / Resources	Date	Achieved
		No Action Required			

Evaluation Outcomes

Information provided & documentation for the module was:	Very easy	<u>5</u> 8	<u>4</u> 8	<u>3</u> 3	<u>2</u>	<u>1</u>	Very poor
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Comments:

Student 9: “Some equipment is not available in our department e.g. OCT hence unable to know how it works practically”.

Communication with members to the course team was:	Very easy & efficient	<u>5</u> 6	<u>4</u> 10	<u>3</u> 3	<u>2</u>	<u>1</u>	Very poor & ineffective
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Learning materials and videos provided for this Module were:	Helpful & Informed learning	<u>5</u> 12	<u>4</u> 6	<u>3</u> 1	<u>2</u>	<u>1</u>	Not appropriate
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The Study tasks provided for this Module were:	Helpful & Informed learning	<u>5</u> 9	<u>4</u> 7	<u>3</u> 2	<u>2</u>	<u>1</u>	Not appropriate
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The instructions provided for the end of Module exam were:	Very helpful	<u>5</u> 9	<u>4</u> 8	<u>3</u> 2	<u>2</u>	<u>1</u>	Not helpful
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Comments:

Student 6: “When I have been reading the exam question the answer will be there but it confused.”
 Student 9: “Improve on providing a clear picture of what kind of questions should we expect.”

Did this Module contain sufficient theoretical background information to allow you to achieve the learning outcomes?	<u>Yes</u> 18	<u>No</u> 1
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Overall I would rate the Module as:	Excellent	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	Poor
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(No figures were recorded for the above question)

Comments:

Student 5: “Questions need to be study task orientated.”
 Student 12: “This module was very educating.”
 Student 15: “I had questions from a study conducted which was not part of the initial learning material.”
 Student 17: “The time was short but it was well prepared.”

External examiners Comments: N/A

Action required arising from 2016/2017 – to transfer to Course Action Plan for AMR

Item No.	Issue Raised during Evaluation	Action to be taken	Staff involved / Resources	Date	Achieved
	(none)				

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Appendix 9c. Student feedback – Sept 2016 cohort, Module 3

Module code and name: HS4303 – Preparing the Patient for Diabetic Eye Screening

Module run: 2016/2017

Number of students registering for module: 18

No of students completing the module	18
No of students passing the module	18
No of non-submissions	0
No of students with current Mit Circs	0
No & reason for withdrawals	0

How was final module evaluation undertaken? Online

Number of student’s evaluation form responses: 10

Who conducted the evaluation? DRS Administration (Gloucestershire Hospitals)

Previous Year’s Action Plan

(To be copied from previous year’s proforma and up date on progress shown)

Action Required

Completed

Item No.	Issue Raised during Evaluation	Action to be taken	Staff involved / Resources	Date	Achieved
		No Action Required			

Evaluation Outcomes

Information provided & documentation for the module was:	Very easy	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	Very poor
		7	3				

Communication with members to the course team was:	Very easy & efficient	5	4	3	2	1	Very poor & ineffective
		6	3	1			

Learning materials and videos provided for this module were:	Helpful & Informed learning	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	Not appropriate
		7	3				

Comments:

Student 1: “The learning materials and videos make studying easier. Good work, please keep it up.”

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The information and guidance for the observed Clinical Assessment was:	Clear and achievable	<u>5</u> 6	<u>4</u> 4	<u>3</u>	<u>2</u>	<u>1</u>	Confusing and hard to achieve
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Assessor Support for the clinical observed assessment was:	Very good	<u>5</u> 10	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	Very poor
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The Study tasks provided for this module were:	Helpful and informed learning	<u>5</u> 5	<u>4</u> 5	<u>3</u>	<u>2</u>	<u>1</u>	Not appropriate
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Information provided for the end of Module Exam were:	Very helpful	<u>5</u> 7	<u>4</u> 3	<u>3</u>	<u>2</u>	<u>1</u>	Not helpful
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Did this Module contain sufficient theoretical background information to allow you to achieve the learning outcomes?	<u>Yes</u> 10	<u>No</u>
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Action required arising from 2016/2017 – to transfer to Course Action Plan for AMR

Item No.	Issue Raised during Evaluation	Action to be taken	Staff involved / Resources	Date	Achieved
	(none)				