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A proposed minimum data set for international primary care optometry: a modified Delphi study

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Abstract

Purpose: To identify a minimum list of metrics of international relevance to public health, research and service development which can be extracted from practice management systems and electronic patient records in primary optometric practice.
Methods: A two stage modified Delphi technique was used. Stage 1 categorised metrics that may be recorded as being part of a primary eye examination by their importance to research using the results from a previous survey of 40 vision science and public health academics. Delphi stage 2 then gauged the opinion of a panel of seven vision science academics and achieved consensus on contentious metrics and methods of grading/classification.
Results: A consensus regarding inclusion and response categories was achieved for nearly all metrics. A recommendation was made of 53 metrics which would be appropriate in a minimum data set.
Conclusions: This minimum data set should be easily integrated into clinical practice yet allow vital data to be collected internationally from primary care optometry. It should not be mistaken for a clinical guideline and should not add workload to the optometrist. A pilot study incorporating an additional Delphi stage prior to implementation is advisable to refine some response categories.

Introduction

Accessing data from primary care services is essential for judging such things as population health and care needs, service uptake, patient outcomes and performance of services. Slade *et al.*[1] highlighted the present inaccessibility of these data from primary care optometry and identified an international requirement for a minimum dataset (MDS). A MDS is a recommendation for standardised minimum set of metrics to be collected along with the method of collection in order to allow aggregated use of data. An optometric MDS would allow audit and benchmarking, as has been performed for some time within other areas of primary and secondary care, for example nursing and intensive care.[2,3]

Metrics to be recorded within a MDS must be clinically relevant, otherwise clinicians are unlikely to record the data consistently and reliably. However, the format in which a metric is recorded is also of importance in order that it has validity for both the clinician who records and utilises it within their practice and for the MDS user (e.g. Researchers and public health professionals) who wishes to process and analyse these data. Forced choice options are generally easier to analyse than free text although from a clinician's perspective it is important that the options are comprehensive and the information is easy to record with as few 'clicks' as possible. If there are various notations or systems for recording clinical findings (e.g. visual acuity, tonometry or fields), the MDS should at least note what approach, equipment *etc.* has been used for recoding a metric. The number of metrics within the MDS is also an issue, although if data is to be routinely collected by clinicians anyway, and is easily extractable from practice electronic patient record software, then this is less of an issue.

There is no set methodology for the development of a MDS and a number of approaches have been used.[4] In the present study, a modified Delphi technique[5] was used (*Figure 1*). The Delphi method was first used by Dalkey and Helmer in 1963[6] and is a structured interactive process involving a panel of experts invited to answer questionnaires in two or more rounds. After each round, a facilitator provides an anonymous summary of the experts' responses to the previous round as well as the reasons they provided for their judgments. The experts are encouraged to revise their earlier responses in light of the replies of other members of their panel. It is expected that during this process the range of the answers will decrease and the group will converge towards a consensus position.

The first stage of the Delphi process used for developing a primary care optometry MDS was reported by Slade *et al.*[1] Stage 1 incorporated consultation with three separate groups, rather than use a single panel of experts:

(1) Potential users of the MDS (e.g. Researchers and public health professionals);
(2) Clinicians working within primary care optometry;
(3) Providers of practice management and electronic patient record software.

Slade *et al.*[1] reported how potential MDS users scored 80 metrics in terms of importance to research and public health on a scale of 1–10. The clinicians working within primary care optometry were asked whether they currently use computer systems within their practice and for which purposes. Just over half of primary care optometric practices now use electronic patient records (EPR, 55%[1]) as opposed to paper records with this proportion appearing to be increasing (39% in a 2014 study[7]). As part of Delphi round 1, the clinicians were also asked about the format in

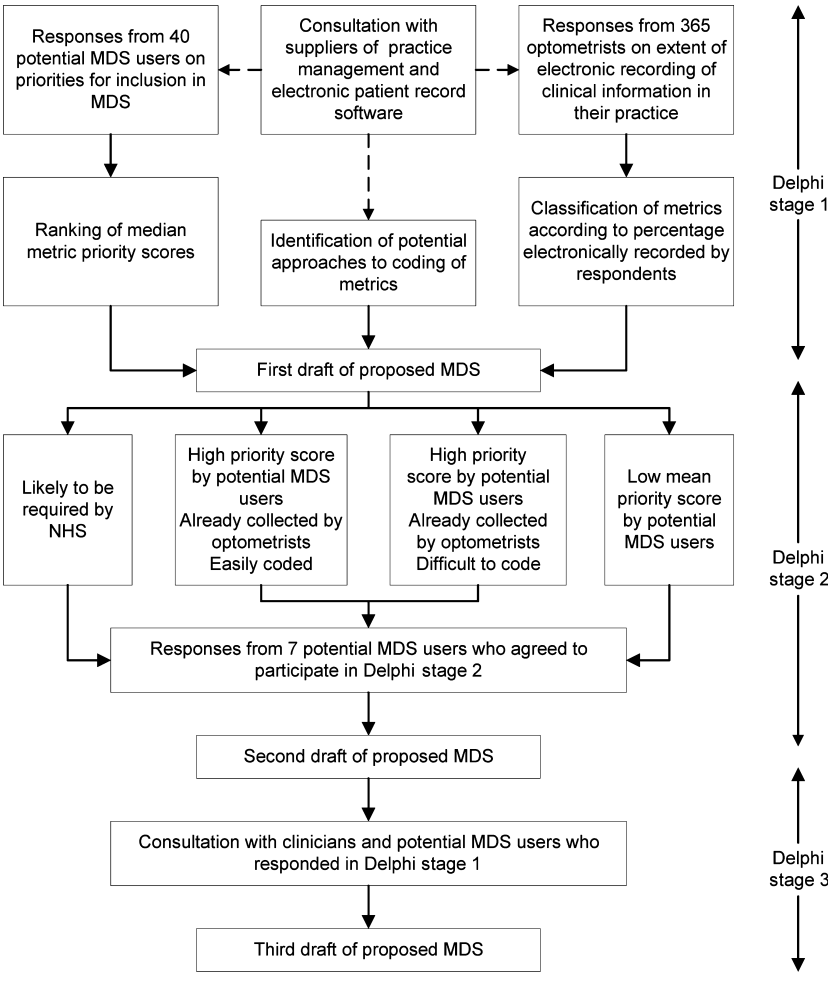

Figure 1. Flowchart of the modified Delphi process.

which they record clinical information. Slade *et al.*[1] reported that software companies would not be a barrier to eventual implementation of a MDS and identified which data was already being collected in practice.

This paper reports stage two of the Delphi process and it is envisaged these results could inform an in-practice pilot of a MDS possibly incorporating a further Delphi stage.

Methodology

The 80 metrics used by Slade *et al.*[1] were evaluated by the authors for inclusion in a MDS. This evaluation was primarily based on:

(1) The importance to potential MDS users (median score of 8 or higher);
(2) Whether it was already routinely recorded electronically as reported by the clinicians working within primary care optometry;
(3) The ease of classification/recording of the metric.

On this basis, metrics were classified by the authors as:

(1) Should be included in a MDS: Data items with a potential MDS user median rank from Delphi stage 1 of 8 or more which were routinely collected and where there was a consensus on how they could be classified (30 metrics);
(2) Borderline or contentious. Data items with a median of 8 or more and were routinely collected but where authors recognised there was variation in grading/classification of the metric within primary care optometry (31 metrics);
(3) Should not be included in a MDS: Data items with a potential MDS user median rank of <8 (19 metrics).

There two exceptions (NHS number and entitlement to benefits) that did not fit into a category and have been considered separately, for example, a metric deemed of low importance to potential MDS users but may be mandatory for payment reasons and therefore routinely collected.

As part of the Delphi stage 1, potential MDS users were asked whether they would be interested in participating in Delphi Stage 2 to help further classify borderline metrics. 13 (of 40) agreed and were sent the metrics for consideration. Stage 2 participants were given the rank of importance (based on mean score) for all metrics along with the authors' recommendation of inclusion, exclusion or borderline. They were instructed to comment on the inclusion/exclusion of borderline metrics and on a proposed classification/grading if this was unclear or had multiple possibilities.

Results

The characteristics of respondents in Delphi stage 1 have been previously described.[1] Seven respondents (of the 13 who originally agreed) contributed to the second round of the Delphi study and all are research active academic staff at lecturer level or above from UK University Optometry Departments (see *Acknowledgments*). All respondents had an interest in clinical optometric research, however their publication histories are extensive and diverse covering public health, epidemiology, electronic patient records, contact lenses, paediatrics, learning disabilities, facial recognition, therapeutics, binocular vision, driving, visual acuity, refractive error, glaucoma and macular disease amongst many others. The proposed MDS, comprising of 53 metrics, is shown in *Table 1* and the metrics that were initially categorised by the authors for definite inclusion have been highlighted. The 23 metrics which have not been included in the MDS are in *Table 2* with those highlighted as being categorised initially by authors for definite exclusion. The opinions of respondents to Delphi stage 2 have been discussed below, and generally did not contest the metrics proposed by the research team for definite inclusion (including proposed classification) or exclusion although where appropriate some of these have been discussed with related metrics.

Patient demographics

There was consensus to include patient date of birth, gender, and ethnicity.

Patient postcode should also be included as it can be used to locate a patient within a particular health geography for commissioning purposes or to calculate other variables such as deprivation score for the locality where the patient lives. Restrictions may need to be placed on who has access to postcode information in order to protect patient identity.

It may also be appropriate to include a software assigned ID number in case it is necessary to link the MDS back to practice held records.

'NHS number' and 'Entitlement for NHS funded services/appliances'

Both NHS number and entitlement for NHS funded services/appliances metrics were deemed of low importance (median priority score of 5 and 6 respectively) to the potential MDS users in the initial Delphi round. These are UK specific metrics however international equivalents would replace them where appropriate, for example Medicare number in Canada or Social security number in the USA.

NHS number is a unique identifier, easily collected, easily validated and is required by the NHS for many other services, thus despite the low median ranking in Delphi stage 1, it is proposed to include it within the MDS. Validation is a method of ensuring the integrity of a metric by checking it complies to certain rules or matches with a database and although possibly not widely known in Optometry, there

Table 1. Final recommendation of metrics and response categories to be included in a minimum dataset for primary eye care

Metric	Response format	Response Categories and notes
Patient Demographics		
Date of birth†	Date	Day/Month/Year
Date of clinical episode†	Date	Day/Month/Year
Gender†	Forced choice	Male/Female/Other/Rather not say
Ethnicity†	Forced choice	Office of National Statistics groupings
Postcode†	Validated text	Standardised format
Software assigned ID number†	Software generated	
Entitlement to benefits†	Forced choice	GOS Groupings
National Health Service number†	Validated text	Standardised format
Occupation	Free text	
Ocular History and Symptoms		
Duration of existing eye conditions†	Number	Days, weeks, months and years (for each eye condition)
Which eye (or surrounding area) presents with the symptoms†	Forced choice & free text	Right/Left/Both/Other
Reason for presenting for an eye exam	Select all that apply & free text	Routine/Reminder. Follow up appointment. New correction required. New frame required. Blurred near vision. Blurred distance vision. Headache. Eye pain. Eye strain/discomfort. Red eye. Doctor advised test. Double vision. Floaters. Visual disturbance. Flashes. Visual distortion. Eyelid lump/redness/swelling. Dry eye. Facial/lid spasm. Abnormal lid position. Proptosis. Anisocoria. Other
If they have any existing eye conditions at presentation	Select all that apply & free text	Full ICD-10, using drop-down lists
Current or previous treatment for eye pathology	Select all that apply with free text & treatment dates for each selection	None. Surgery. Medication (then full BNF using drop downs). Ophthalmic review. Orthoptic treatment/exercises. Other
General Health		
Name of any existing systemic conditions	Select all that apply & free text	Full ICD-10, using drop-down menus
Current medications for systemic conditions	Select all that apply & free text	Full BNF, using drop down menus
Lifestyle Choices		
Whether or not the patient is a smoker†	Forced choice & date	Current/Ex/Never From (date); to (date)
Whether or not the patient is a driver†	Forced choice	Yes/No
Family History		
Family history of glaucoma	Select all that apply & free text	Mother. Father. Sibling. Son/Daughter. Other
Family history of Age Related Macular Degeneration	Select all that apply & free text	Mother. Father. Sibling. Other
Family history of other eye disease	Select all that apply, with full ICD-10 using drop-down menus & free text	Mother. Father. Sibling. Son/Daughter. Other
Family history of diabetes	Select all that apply & free text	Mother. Father. Sibling. Son/Daughter. Other. Ability to specify type.
Current Refraction Details		
Monocular visual acuity with current spectacles for each eye†	Validated number	Distance & near. Notation required (e.g. LogMAR/Snellen)
Current spectacle prescription/ refraction details†	Validated number	Sphere/Cylinder/Axis/Add
Monocular unaided vision for each eye†	Validated number	Distance & near. Notation required (e.g. LogMAR/Snellen)
Binocular visual acuity with current spectacles†	Validated number	Distance & near. Notation required (e.g. LogMAR/Snellen)
Binocular unaided vision†	Validated number	Distance & near. Notation required (e.g. LogMAR/Snellen)
Type of spectacles worn†	Select all that apply & free text	Single vision distance. Single vision near. Single vision intermediate. Bifocal. Progressive addition lens. Business/vocational.

(continued)

Table 1 (continued)

Metric	Response format	Response Categories and notes
Current contact lens specification	Free text	Fully validated specification not possible.
	Validated number	Sphere/Cylinder/Axis/Add
	Forced choice	Modality: Daily disposable/Daily removal/Extended
	Forced choice	Material: RGP/Soft/Silicon Hydrogel
	Number	Disposal: Days/weeks/months
Clinical Test Results		
Distance visual acuity†	Validated number	With refraction result. Notation required (e.g. LogMAR/Snellen)
Refraction result†	Validated number	Sphere/Cylinder/Axis/Add
Near visual acuity†	Validated number	With refraction result. Notation required (e.g. LogMAR/Snellen)
Tonometry†	Number (IOP, up to 4 per eye) Forced choice (method of tonometry). Time.	Method of tonometry: Goldmann applanation tonometry. Other applanation/contact tonometry. Non-contact tonometry. Rebound tonometry. Other. 24 h clock; h/min.
Method of fundus examination†	Select all that apply & free text	Dilated. Undilated. Direct. Slit lamp indirect (e.g. Volk). Headband indirect. Retinal camera. Widefield Scanning Laser Ophthalmoscope. Other
Ophthalmic drugs used in examination (e.g.mydriatic)†	Select all that apply & free text	Full Optometrists formulary using drops downs
Visual Fields	Forced choice & free text	Normal. Suspicious. Pathological defect. Unreliable
Colour vision	Forced choice & free text	Protanomaly. Deuteranomaly. Unspecified red/green. Tritanomaly. Acquired (specify). Normal. Other. Test type (free text)
Stereopsis	Number & free text	Seconds of arc Test type (free text)
Amsler	Select all that apply & free text	Normal. Distortion (metamorphopsia). Missing lines (scotoma)
Binocular vision assessment	Forced choice & free text	Orthophoria. Compensated heterophoria. Decompensated heterophoria. Heterotropia
Motility	Forced choice & free text	Normal. Limited. Incomitant
Pupil reactions	Forced choice & free text	Normal. Abnormal
Clinical signs found in anterior eye examination	Select all that apply & free text	Full ICD-10, using drop-down menus
Clinical signs found in internal examination	Select all that apply & free text	Crystalline lens. Vitreous. Optic disc. Retinal blood vessels. Retina. Macula
Examination Outcomes		
If the patient was referred†	Forced choice	Yes/No
How urgently the patient was referred†	Number	Days, weeks, months
Who the patient was referred to†	Select all that apply & free text	GP/Hospital/Optometrist/Social Services/Other
Why the patient was referred	Select all that apply & free text	Full ICD-10, using drop-down menus
Whether there was a clinically significant change in refraction	Forced choice	Yes/No
Whether spectacles/contact lenses were prescribed†	Select all that apply & free text	Spectacles/Contact lenses/Other
How much refraction has changed†	Validated Number	From prescription metrics
Purpose for which spectacles/ contact lenses were prescribed†	Select all that apply & free text	Distance/Near/Bifocal/Progressive/Other
Recommended recall date for the next eye examination†	Validated number	Months/Years

GOS, General Ophthalmic Services. ICD-10, International Classification of Diseases 10. BNF, British National Formulary.
†Metrics that were initially recommended to Delphi stage 2 respondents for inclusion by the authors based on the results from Slade *et al.*[1] and having a grading/classification scale that was not contentious.

are look-up systems for NHS number that could be used. It is highly likely that NHS number will be required for funding of future services,[8,9] perhaps with the introduction of electronic submission of claim forms for General Ophthalmic Services (GOS).

It is also proposed to include eligibility criteria for NHS funded services or appliances, as this is also likely to be extracted as part of the NHS payments system for GOS services/appliances and hence collection will be of limited burden for the practice,[10] All residents of Scotland are eligible

Table 2. Metrics not included in a minimum dataset This could be due to lack of importance to research and public health (based on the results from Slade *et al.*[1] and consensus in the present study) or due to difficulty in classifying/grading the metric.

Patient Demographics
Other aspects related to patient demographics†
Patient name†
Ocular History and Symptoms
Any other data related to eye health†
General Health
Previous treatment for systemic conditions
Planned future treatment for systemic conditions (e.g. surgery)†
Other aspects related to general health†
Lifestyle Choices
How long the patient has been a smoker†
If the patient has given up smoking how long ago it was†
Whether the patient drinks alcohol
The amount of alcohol that is drunk†
What sort of hobbies or interests the patient has†
If the patient has given up alcohol†
Other aspects relating to patient lifestyle†
Family History
Family history of other eye conditions†
Family history of other systemic disease†
Family history of spectacle/contact lens wear†
Other aspects related to family history†
Current Refraction Details
Purpose for which spectacles worn
Whether spectacles are worn full time or only for specific purposes†
Any other aspects related to refraction and spectacles/contact lenses†
Clinical Test Results
Clinical signs found in surrounding eye area
Results of any other clinical tests†
Examination Outcomes
Any other information about the advice given to the patient†

†Metrics that were initially recommended to Delphi stage 2 respondents for exclusion by the authors based on the results from Slade *et al.*[1]

for NHS funded eye examinations, but eligibility criteria still apply for funding towards optical appliances. Information about receipt of means tested State benefits will also provide another indicator of socioeconomic status, and medical/family history of glaucoma, diabetes *etc.* may also have some utility for public health purposes.

Occupation

The UK Office for National Statistics Socio-economic classifications[11] were proposed to Delphi stage 2 respondents as these are widely used for public health purposes. However the information of importance to the potential MDS users may be at odds to that which is of importance to the clinician. One Delphi stage 2 respondent suggested alternative categories of 'pre-school', 'student', 'unemployed', 'administration', 'manual', 'vehicle operator' and 'retired', however this does not address the concerns of the other respondents that if the categories are not clinically relevant then recording will be poor and these data will be unreliable. Some Delphi stage 2 respondents appreciated forced choice for simplifying analysis, but if there is not a categorisation equally valid for both researcher and clinician then free text is the most reliable format allowing later classification with predefined protocols. In any case, it is proposed to include postcode within the MDS, and hence it would be possible to use this to derive deprivation scores for the postcode in which the patient lives, and hence provide a proxy for the socioeconomic status of the patients themselves.

History and symptoms

'Reason for presenting for an eye exam' and 'details of any symptoms experienced'

Within Delphi stage 1, these metrics were both of importance and routinely collected but the authors were mainly concerned with the appropriateness of the response format and completeness of the categories. The Delphi stage 2 respondents suggested that they could be combined and redefined in terms of 'primary reason for presenting'. Consensus was unanimous in support of a format that encouraged clinicians to 'select all that apply' with the option of an additional free text response. The Delphi stage 2 respondents were also broadly in favour of the response categories, however additional categories were suggested to assist differential diagnosis[12,13] and avoid lost data for epidemiological research. The additional categories were: 'follow up appointment', 'new correction required', separation of 'distance' from 'near' blur and separation of 'discomfort' from 'pain'. One Delphi stage 2 respondent felt that 'symptoms/routine/other' would equally suffice.

Existing eye conditions at presentation

The Delphi stage 2 consensus was strongly in favour of keeping this metric and using the World Health Organisation International Classification of Diseases Version 10 (ICD-10).[14] ICD-10 is a medical classification system for diseases, signs and symptoms, abnormal findings, complaints, social circumstances, and external causes of injury or diseases. Related pathologies are grouped into blocks, for example H43-H45 contains the codes for 'disorders of vitreous body and globe'. Depending on certainty and specificity of the diagnosis, a clinician could record a diagnosis of asteroid hyalosis at this block level, or as H43 for disorders of vitreous body or H43.2 for 'crystalline deposits in vitreous body' after a maximum of three clicks[14] without having to remember that the code is H43.2. In the case of a disease sub-classification (e.g. Wet v Dry AMD) not being present in ICD-10[15] the free text could supplement it.

The duration of any existing eye conditions and which eye (or surrounding area) is affected by symptoms should also be recorded.

Current or previous treatment for existing eye and systemic conditions

These metrics were judged to be of importance to potential MDS users in Delphi stage 1, however, classification of the type of treatment is challenging. The Delphi stage 2 respondents agreed further classification for type of surgery may be too complicated or time consuming. 'Current' and 'previous treatment' were initially separate but a number of Delphi stage 2 respondents expressed concern over the specificity of terms such as 'impending', 'recent', 'current' and 'previous' and recommended that these could be replaced by the approximate dates of treatment as recalled by the patient. The additional response category 'orthoptic treatment/exercises' was also suggested.

Use of a national formulary, for example the British National Formulary (BNF) was strongly supported by respondents, and similar to the ICD-10, intelligent use of drop-down menus should allow clinicians to be as specific as they want to be, but still be of use if patients cannot recall the exact drugs they are taking. For example, with one click the clinician can specify what the drug is treating (e.g. glaucoma), with one more click the class of drug (e.g. prostaglandin analogue), or with an extra click the exact drug (e.g. Latanoprost). One Delphi stage 2 respondent also identified 'previous treatment for systemic conditions' as being sometimes important clinically, however, the majority view was that it was superfluous to a primary care optometry MDS.

Lifestyle choices

There are a number of metrics relating to smoking, the simplest being whether the patient smokes or not, which was desired in Delphi stage 1 by potential MDS users and also routinely collected and therefore included in the MDS. Inclusion of further information about duration or amount of smoking divided opinion within Delphi stage 2. 'How much the patient smokes' was thought to be impossible to accurately quantify and therefore unreliable. Historically it was appropriate to ask patients how many cigarettes they smoked per day, however 'roll your own' tobacco is becoming more popular and now accounts for one in three smokers.[16] Two Delphi stage 2 respondents stated it was important to identify previous smokers, which could be implemented simply by including 'to' and 'from' dates alongside the smoking question already included in the MDS.

Although reported as important during Delphi stage 1, alcohol consumption was identified as being of low importance clinically. Therefore results are likely to be unreliable and it should not be included.

It was also deemed appropriate to record whether or not the patient drives a vehicle, as this may be more valid than whether they hold a driving licence.

Family history

Glaucoma, AMD, cataract, genetic eye disease, diabetes and heart disease were considered separately. Clinical geneticists record family history via a full pedigree but this is not realistic in primary care optometry. The Delphi stage 2 consensus was strongly in favour of discarding metrics for family history of cataract or heart disease due to the number of other risk factors and the difficulty in quantifying risk. This would not preclude clinicians recording cataract family history if deemed appropriate. Family history of glaucoma was judged as the most important inheritance risk factor to potential MDS users and all direct relatives have been included as they have different risk ratios[17] apart from mother/father.

Parent gender has been separated as it adds no additional workload to the clinician (the patient normally specifies which parent without prompting) and it may be of relevance to other familial conditions which allows the response categories to be consistent for AMD and genetic eye disease. Consensus was strongly in favour of these categories without 'son/daughter' for AMD due to the age-related incidence. Respondents were in favour of including 'genetic eye disease' but identified that patients won't know which eye conditions are genetic hence it could be renamed 'other eye conditions' which then allows the clinician to select the disease from ICD-10 if in their clinical opinion they feel it is relevant. Ability to specify type of diabetes was also of importance.

Current refraction details

Current contact lens specification

This metric was deemed as important to potential MDS users and clinicians in Delphi stage 1, and a full validated specification including manufacturer/design would be of value, for example within case control investigations of contaminated products. However, most Delphi stage 2 respondents acknowledged that this may be impractical due to the variety of different manufacturers, designs and materials and the speed with which lenses get released or rebranded would make producing a standard validation database very difficult. A Delphi stage 2 consensus was not obtained and the majority of respondents remained undecided, although the easily categorised elements of the metric could be included, for example wear modality, frequency of replacement, type of material, prescription.

Purpose for which spectacles worn

This metric was wanted by Delphi stage 1 potential MDS users and is usually collected in practice, however, all but one respondent in stage 2 wanted to discard this metric. Due to the potentially wide, complex and personal range of

uses it may be very difficult to categorise therefore the results could be meaningless.

Clinical test results

Visual fields

Although of definite interest to Delphi stage 1 potential MDS users, this is perhaps the most difficult metric as there is no single way of recording visual field impairment to adequately classify the results. Some methods have been suggested, but tend to be specific to certain automated field assessment machines (e.g. Hodapp *et al.*[18] for the Humphrey Visual Field Analyser; www.zeiss.com) of which there are a diverse selection in use in primary care optometry, and a range of different testing strategies on each. Responses in Delphi stage 2 were split, with the majority preferring a simple classification system (Normal. Suspicious. Pathological defect. Unreliable) as a way of covering all potential defects albeit losing some detail. One Delphi stage 2 respondent suggested discarding this metric due to the difficulty in classification and hence giving unreliable data. One stage 2 respondent suggested a more complex classification system retaining better diagnostic information. Subjectivity of 'physiological defect' meant that this category should be not be used.

Colour vision

In addition to recording the specific colour vision abnormality, the MDS could include details of the type and manufacturer of colour vision test, which, alongside the version of the test, the age or condition of the test and the often non-standardised testing conditions could lead to huge variability in the quality of data collected. These reasons resulted in two Delphi stage 2 respondents suggesting discarding the metric. The remainder agreed on the inclusion of a simple classification system (*Table 1*) without the test type/manufacturer, although one respondent suggested the more comprehensive grading system from ICD-10 which may suffer from a lack of validity due to the aforementioned variability in recording. Given clinicians may record type/manufacturer of test anyway it is expected they will utilise the additional free text to specify this along with other relevant clinical details. The content of this field following a pilot and further Delphi stage would help to inform whether test type should be included in a subsequent version of the proposed MDS.

Stereopsis

Opinion in Delphi stage 2 was split on whether to record the type of test used to assess stereopsis, with three respondents wanting to retain the metric and format, one with no view, and three wanting to discard due to the large variability of testing meaning reduced validity. Similarly to 'Colour vision' it is therefore proposed to retain the facility to record test type as free text, and the results from a pilot study would help to refine this.

Amsler

Clinicians often sketch, or ask the patient to sketch, any defects found on Amsler when using paper records to illustrate both location and size which is difficult to capture as part of a MDS. Two Delphi stage 2 respondents chose to omit this metric however the majority agreed on inclusion. One respondent identified an improvement would be a 'select all that apply' response format and would be most appropriate in case patients report both distortion and missing lines.

Binocular vision assessment

This was an important metric to Delphi stage 1 potential MDS users, however a binocular vision assessment can vary greatly in its content. The majority of the stage 2 respondents regarded simple response options of abnormal/suspicious/normal as invalid due to their gross subjectivity and one rejected the metric entirely for this reason. There was broad consensus in Delphi stage 2 of a less subjective classification (*Table 1*) however these data should still be approached with caution. Deviation was not included as even under experimental conditions inter-examiner repeatability is poor.[19]

Motility

Subjectivity renders an abnormal/suspicious/normal system invalid, however the majority of Delphi stage 2 respondents felt it should still be included with alternative categories (*Table 1*). It would be unrealistic to isolate and document the muscle/nerve of underaction in all cases.

Pupil reactions

Those Delphi stage 2 respondents with an opinion uniformly felt it should still be included, with one suggesting a more comprehensive classification and the remainder agreeing with a binary abnormal/normal system with an additional free text box. Potential MDS users using this metric would likely categorise the free text according to their needs.

Clinical signs found in surrounding eye area (e.g. pigmentation)

All but one respondent suggested exclusion of this metric due to low importance in Delphi stage 1, burden on the clinician and ambiguity of metric. These data are routinely recorded in primary care and are potentially clinically valuable; however the above reasons would invalidate these data for research and public health purposes.

Clinical signs found in anterior eye examination
Although clinically essential, this metric is very difficult to classify due to the large variety of tissues and pathologies it covers. The consensus was that these data should be included but an abnormal/suspicious/normal system is too simple. There are various grading systems that could be incorporated here, and Delphi stage 2 respondents who gave an opinion suggested the ICD-10. However this may lose data when a clinician detects a suspicious abnormality but is not certain of the diagnosis (e.g. uncertain whether a lesion is malignant or not). In combination with the free text box, ICD-10 is probably the most comprehensive solution that can be compatible with research but it must be stressed that this is merely for the purpose of a MDS, and there are much more comprehensive recording mechanisms to be used in tandem to enhance the clinical record.

Clinical signs found in internal examination (e.g. lens haze, disc appearance, macula appearance)
There is a difficulty of classification with such a wide variety of normal and abnormal findings. There is also overlap with metrics deemed more important (e.g. 'why the patient was referred'). Consensus in Delphi stage 2 was for inclusion and respondents felt this metric should be divided by ocular structure (*Table 1*). There are various published grading scales that could then potentially be used to sub classify variation and abnormalities of each structure (e.g. lens[20,21]) however further work including a literature review would be required to determine the most appropriate for primary care optometry.

Examination outcomes

Whether refraction has changed
This metric is also on the GOS1 claim form for NHS funded sight tests and is a clinical decision rather than a numerical difference in prescription which could be obtained from the prescription metrics, especially if it is possible to link the results of sight tests via the NHS number. However one respondent highlighted that this is dependent on the repeatability of refraction.[22] In order to emphasize this metric as a clinical decision a suggestion was to rename the metric 'whether there was a clinically significant change in refraction'. The majority of Delphi stage 2 respondents, with an opinion, were in support of inclusion.

Discussion

While this paper describes a proposed MDS, a pilot study incorporating a Delphi stage 3 will assist with further refining of which metrics should be included or excluded and how the included metrics should be classified and recorded. Analysis of free text box usage should be particularly informative.

The optical professionals may need to change the way that clinical information is documented, for example with drop down boxes rather than free text, or starting to document tests such as visual fields in one of a more limited range of ways. However, it is important to note that just because there is a data field within the MDS, this does not mean that it has to be completed. For example, including a metric for stereopsis does not mean that this needs to be measured for all patients, only that if an optometrist deems that assessing stereopsis is appropriate for a particular patient, then the findings should be recorded. However, this is no different to existing professional good practice on record keeping.[23]

Further development of the MDS will face challenges that are; political, professional, financial and technical. The optical sector may see the MDS as yet another addition to their workload without financial recompense. Thus, there is a danger that negotiations about the implementation of the MDS get caught up with other negotiations around fees and payments associated with the GOS contract. Key to successful compliance with the MDS will be demonstration that the MDS does not require much or any additional data to that already collected. Indeed, if the MDS is associated with automated capture of activity under a GOS contract and electronic patient referral to secondary care, then there might actually be long term cost and time savings for the optical sector.

In order to capture data for the MDS it is likely that software used in primary care optometry will need to be updated to be MDS compliant. The software manufacturers do not see this as an issue if that is what is required by their customers.[1] However, it is unreasonable to expect a practice to change software that is otherwise suited to their needs, with the accompanying costs and training requirements. Slade *et al.*[1] reported that 10% of practices do not currently use a computer. Of those who do use a computer 45% do use it for electronic patient records. The reasons for not using electronic records included: 'content with established paper system', 49%; 'too difficult to change from paper to computer records', 28%; 'no computer in consulting room', 22%; 'cost of software', 20%; 'low IT knowledge', 12%; 'cost of hardware', 9%. Thus, financial investment will be required to facilitate practices being 'MDS ready'.

There will be technical challenges of ensuring that data can be extracted from practice systems in a reliable and safe way for example there are privacy and ethical issues in sharing some of these data without the correct level of anonymisation. The NHS N3 private network (www.n3.nhs.uk) has been designed for the use of NHS trusts and other appropriate stakeholders to allow secure transfer of potentially sensitive patient data. GP practices are required

to have an N3 connection. However, dental information is input to a central web-based solution using standard internet. Ultimately, a decision would need to be made regarding risk and the sensitivity of the data being transferred to determine the most suitable electronic solution for data transfer and storage.

Although a consensus Delphi approach was used to develop the proposed MDS, the third stage of the Delphi process is yet to be performed and further consultation will be required with clinicians who would provide data and potential users of the MDS. Piloting will be required of proposed option choices within the metrics to assess whether they are fit for purpose both clinically and for research/public health purposes. Although forced choice has been used where possible to allow clean data, free text boxes (and other mechanisms) are essential from a clinical perspective. Free text data will help refine the MDS over time by identifying missing response categories. Software engineers will then need to incorporate the MDS into existing user-friendly clinical interfaces. Some metrics, for example visual acuity, would require the practice to select their preferred notation, for example Snellen. When subsequently analysed for research purposes conversion will be possible (in this example to LogMAR as that is the gold standard for research), albeit not ideal.[24,25] Further development may involve opinion from a specialist questionnaire designer and optometrist focus groups to identify ambiguous, poorly worded or missing response categories from a clinical perspective.

The views of patients should also be incorporated, although many patients already assume that data is shared within the NHS in order to facilitate improvements in quality of care. There will nonetheless be ethical and legal data protection issues which require further consideration.

Ethical aspects of using anonymous patient data for public health purposes need to be considered[26] alongside issues of holding patient identifiable data (PID). Postcodes may be required for service planning, however may not be required for research purposes as these data could be converted prior to use, for example Deprivation or socioeconomic groupings.[27]

It must be stressed once again that this is a MDS designed to allow ease of input and therefore result in valid data extraction. It is not a clinical guideline and should not put onus on the profession in this regard, for example, 'Unaided distance visual acuity' is in the MDS however may not be routinely collected for high myopes as it is of little clinical value. It is concerning whether data collected in this way would be reliable enough for research purposes due to the lack of standardisation of clinical practice, however epidemiological data in other professions are collected in similar ways. As the MDS is implemented, or as part of a pilot, these data would need validating so their reliability can be established.

Limitations

While the Delphi technique is a recognised tool for developing consensus positions it does have a number of weaknesses. Due to the iterative process that is integral to the Delphi process, there exists the potential for low response rates if people drop out after each round. Fourteen academics originally agreed to participate in stage 2 and were sent the metrics, but only seven (54%) finally responded. Whilst seven potential MDS users may seem a small number to include within Delphi stage 2, this is in keeping with other studies that have used the Delphi technique to develop a minimum dataset. For example Bagley-Thompson and Schaffer[5] had eight respondents within their second Delphi round. Potential concerns about the final proposed MDS being biased by small numbers could be ameliorated by inviting all the individuals who responded to stage 1 to participate in a further Delphi stage as part of a pilot study. The fact that that the Delphi technique is iterative and sequential also means that it can be time-consuming and laborious, as it is necessary to give sufficient time for panel members to consider their own position and to reflect on the views of other panel members. The fact that panel members do this process in isolation from one another also means that there is a risk of the facilitators moulding opinions if they (un)intentionally give more weight to one perspective than another. The process of producing summary documents to be considered in subsequent rounds, is however, more than just providing a statistical report of 'how many people said what' as it is necessary to recognise that panel members have differing expertise and a minority of respondents may identify an issue that is missed by the majority.

There are still issues with some important metrics which have been highlighted in the results as requiring further reflection: Occupation, Clinical signs found in internal examination, Visual fields and Contact lens specification. It is not possible to comprehensively gather all the clinical information in these instances which limits the usefulness of the MDS, however this will be outweighed in part by the large size of the datasets. The inclusion of free text boxes will allow development of the MDS and refinement of these metrics in future. Some metrics may be more difficult to classify than they first appear, for example, gender. The sex assigned at birth may be more clinically relevant due to risk factors, however this may not be what the patient identifies as.

Conclusions

This MDS should be easily integrated into clinical practice yet allow essential data to be collected internationally from primary eye care. These data are currently inaccessible yet vital for judging such things as population health and care

needs, service uptake, patient outcomes and performance of services. It should not be mistaken for a clinical guideline and should not add workload to the optometrist. A pilot study incorporating an additional Delphi stage prior to implementation is advisable to refine some response categories and as a demonstration of the breadth of research questions which could be answered.

Disclosure

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