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ORIGINAL ARTICLE

Task Sharing: Development of Evidence Based Co-Management Strategy Model for Screening, Detection and Management of Diabetic Retinopathy

Running title: Task sharing model for DR

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ABSTRACT

Background: The number of adults with diabetes is increasing worldwide and also the number of people with diabetic retinopathy (DR), a major complication of diabetes. Task sharing in eye care for people with diabetes could address the shortage in the number of ophthalmologists and increase access to eye care services. This study investigated the opinion of eye care professionals for a checklist of tasks, which are involved in DR management, to be possibly shared by optometrists and mid-level eye and health care workers with ophthalmologists.

Methods: The study used a purposive sampling technique. All available eye and health care workers from five selected hospitals in two provinces in Pakistan were recruited. A cross-sectional survey was conducted to investigate the potential roles of various cadres in eye care delivery for people with diabetes.

Results: Ninety-six (79%) participants including doctors (n=56), optometrists (n=29) and mid-level eye care workers (n=11) responded to the survey. Two-thirds of the participants suggested mid-level eye care workers while 88.5% stated that lady health workers could provide education and health promotion to people with diabetes. Most of the participants (88.5%) suggested that optometrists could share the task of dilated ophthalmoscopy with ophthalmologists for detection of DR and make referrals to ophthalmologists if needed. Ophthalmologists remained the recommended cadre to undertake the eye examinations of patients with proliferative diabetic retinopathy and diabetic macular edema.

Conclusion: This research provided an insight on how task sharing in DR management can be implemented by optimizing the roles of eye care workers.

BACKGROUND

While diabetes will continue to be a major problem in developed countries, it is estimated that approx. 70% of all new cases will appear in the developing countries[1]. Diabetic retinopathy (DR) is a well-recognized complication of diabetes and one of the major causes of vision loss [2, 3]. The increasing global prevalence of diabetes, rapidly occurring social and environmental changes, changing lifestyles and the disparity in health care equity in the developing countries will result in a greater burden of visual impairment and blindness due to DR [4, 5].

Many people with diabetes visit ophthalmologists only after they have lost vision [6]. Delay in presentation has been noted as a major problem in the management of DR. This is mainly due to the shortage ophthalmologists and is further exacerbated by inadequate or lack of well-coordinated primary eye care and timely screening for DR to prevent vision loss [7, 8]. Research in Australia showed that shared care between local optometrists and hospital-based ophthalmologists improved access to care for people with stable age related macular degeneration, DR and glaucoma [9].

The development of optometry training programs in Pakistan, India and other countries in Africa, enabled these countries to increase the numbers of optometrists [10]. It is necessary to

realize the potential role that optometrists and mid-level eye care workers can play as part of an eye care team in DR screening, detection and referral for management. Task sharing amongst these cadres could provide a crucial bridge between the ophthalmologist and the community in eye care and prevention of vision loss through increased access to eye care services[11-13].

As reported in the literature there are some conflicts and issues regarding the practice of task sharing[14, 15]. These include lack of defining the specific skills and the scope of practice that a health worker could perform correctly[13, 14]. This study aimed to develop a checklist of tasks, based on the opinion of eye care professionals, to be possibly shared by optometrists and mid-level eye and health care workers in eye care delivery for people with diabetes.

METHODS

Purposive sampling technique was used for the study. Detail methodology is reported elsewhere[11]. The recruited participants included:

I. Doctors: Ophthalmologists, Endocrinologists/diabetologists and health administrators.
II. Optometrists: In Pakistan, 4 year graduate optometrists were available in tertiary eye care facilities to assist ophthalmologists in refraction, contact lenses and low vision rehabilitation services.

III. Mid-level eye care workers: Orthoptists are available only in tertiary eye care facilities working with paediatric ophthalmologists to assist in testing visual acuity in children, squint assessment and amblyopia therapy. Refractionists and ophthalmic technicians assist ophthalmologists in tertiary and secondary level hospitals[11].

A semi-structured questionnaire with a cover letter stating the purpose of the study and to obtain their consent for participation were sent to all available eye care workers from the selected sites. The survey 'Checklist for Clinical Tasks by the Eye Care Workers for the Development of Evidence Based Co-Management Strategy Model for Screening, Detection and Management of Diabetic Retinopathy' consisted of two sections. The first section generated demographic data to obtain participants' information about their sex, age, type of organization where the participant worked at such as a public hospital or NGO, job positions at the organization and the length of job experience in the provision of eye and/or health care.

The second section of the survey provided a list of activities (or tasks) involved in screening and detection of DR. The list was restricted to a selection of tasks based upon their importance and the needs of the people with diabetes. It did not include medical and surgical management of DR because that could only be done by ophthalmologists. The tasks were based on the standardized training for optometrists and mid-level eye care workers and appropriate supervision by senior optometrists and ophthalmologists. These tasks were

categorized under headings in the survey which included: (i) health education (health promotion, awareness and counselling); (ii) screening of individuals with diabetes for detection of DR, (iii) examination of patients with diabetes for DR attending an eye care facility; and (iv) decision on the need for follow-up of people with DR.

Task Sharing is defined as "*the rational distribution of tasks among health workforce teams, with specific tasks moved from highly qualified health workers to health workers with shorter training and fewer but adequate qualifications for the task assigned (under supervision), to share tasks and make their collaboration and communication more efficient to achieve a task by co-managing on common ground in order to make efficient use of the available human resources*"[11].

For the checklist of current and proposed tasks, each task in the table was cross-referenced against the cadres related to eye care delivery for people with diabetes. Participants were asked to mark X in the first column to indicate which cadres are currently performing that task. A cross was used again in the second column to indicate to which cadres that task could be ceded in a task sharing model which would be both safe and effective.

The survey was sent to the recruited participants via email. Follow ups were conducted after mailing the survey and at least 4 reminders through emails were sent to the heads of organizations or directly to participants where possible.

Ethics approval was obtained from the Human Research and Ethics Committee of the Royal Victorian Eye and Ear Hospital, Australia. Separate formal consent was not sent to the participants for the emailed survey as consent was assumed if the survey form was completed and returned. Participation was voluntary and confidentiality was maintained.

SPSS (Statistical Package for Social Sciences) version 19 (IBM Corp, Armonk, NY, USA) was used for analysis of quantitative data from the study.

RESULTS

Of the 121 potential participants recruited for the study, 96 (79%) took part in the study. Table 1 presents demographics of the participants.

[Table 1]

Most of the participants reported two or more cadres doing a particular task in the current situation, and similarly the participants suggested a task to be done by two or more cadres in the task sharing model. Therefore, the number of responses exceeded the number of respondents.

Education and health promotion

Education included risks factors for DR associated with obesity, diet and smoking, lifestyle, prevention of vision loss from diabetic retinopathy, diabetic retinopathy treatment and education on management of hypertension and lipid abnormalities. Among the participants 61.5% (n=59/96) reported that education and health promotion was provided by ophthalmologists. The majority (68.8%; n=65) of the participants including 35 doctors, 23 optometrists and 7 mid-level eye care workers suggested that this task could be performed by optometrists while 88.5 % of the participants suggested that lady health workers (LHW) could perform this task. Figure 1 shows comparison of responses on current and potential provision of education on diabetes control and risk factors.

[Figure 1]

Vision testing

Participants reported that vision testing is currently being carried out by several cadres including ophthalmologists, optometrists, refractionists and ophthalmic technicians. When that was compared to the participants' suggested cadres who could do vision testing in the

task sharing model, more than two-thirds of the participants suggested that mid-level eye and health care worker could also do vision testing. Of the participants 76 % (including 43 doctors, 23 optometrists) suggested that diabetes educators and 70% reported LHWs could perform the task of vision testing. These two cadres currently have no significant role in vision testing in outreach programs.

Refraction

Most of the participants (93.8%) indicated that refraction for people with diabetes attending eye care facilities was mainly the role of optometrists. From the participants, 68.8% (n=66, including 38 doctors) reported that refractionists and 56.2% reported that ophthalmologists were also tasked with this role. However, the number of participants who suggested refractionists to continue this duty increased from 68.8% to 91.7% while there was a decline in the number for ophthalmologists and optometrists for this task in a task sharing model.

Non-mydriatic retinal photography

About half of the participants (48%) reported that non-mydriatic photography is being performed by ophthalmologists and 27 % reported that ophthalmic technicians and 15% reported that optometrists also conduct non-mydriatic retinal photography. However, this increased to 47% and 45% of the participants suggesting that optometrists and refractionists could be involved in performing non-mydriatic retinal photography. Most of

the doctors (69.6%) suggested ophthalmic technicians to carry out non-mydriatic retinal photography.

Mydriatic retinal photography

The responses indicated that mydriatic retinal photography is currently being shared among ophthalmologists, optometrists and ophthalmic technicians in eye care facilities. However, 50% (including 30 doctors) of the participants suggested that refractionists and 87.5% (including 50 doctors) suggested that ophthalmic technicians could also perform mydriatic retinal photography in eye care facilities

Fluorescein Fundus Angiography

Almost two-thirds (63.5 %) of the participants indicated that performing fluorescein fundus angiography is currently the role of ophthalmologists while 34.4% reported that optometrists and 33.3 % indicated that ophthalmic technicians also perform fluorescein fundus angiography in eye care facilities in Pakistan. However, in the task sharing model more than half (51% to 60 %) of the participants suggested that optometrists, refractionists and ophthalmic technicians could share the task of fluorescein fundus angiography under supervision of ophthalmologists to reduce the burden on ophthalmologists.

Slit lamp bio-microscopy

As expected, 73% (n=70/96) of the participants reported that slit lamp bio-microscopy is performed by ophthalmologists. However, 69% (n=66/96; including 29 doctors and 27 optometrists) of the participants indicated that optometrists could also play a role in performing slit lamp bio-microscopy to support the activities of ophthalmologists in detection of DR and making referrals to ophthalmologists if needed.

Tonometry

Approximately 90% of the participants indicated that ophthalmologists currently carry out tonometry and 49% reported that optometrists also carry out tonometry in eye care facilities. However, the results showed that 76 % (n=73/96) of the participants suggested that optometrists could carry out tonometry to reduce the burden on ophthalmologists and 69 % (n=67/96, including 40 doctors) of the participants suggested to include refractionists in carrying out tonometry in the task sharing model.

Dilated ophthalmoscopy

Most of the participants (97%) reported that currently ophthalmologists perform dilated ophthalmoscopy on people with diabetes in eye care facilities while 42% of participants indicated that the procedure is also done by optometrists at their eye care facilities. However, 88.5% participants including 47 doctors suggested that optometrists could share the task of dilated ophthalmoscopy with ophthalmologists for detection of DR and making referrals to the ophthalmologists if needed.

Grading of diabetic retinopathy

All the participants indicated that grading of DR in eye care facilities is performed by ophthalmologists. Amongst the participants only 29.2% (including 20 doctors) indicated that optometrists also currently perform this role in their eye care facilities. However this increased to 81.2% (including 41 doctors and 27 optometrists) for optometrists to undertake this task in a task sharing model.

Decision for need of referral to an eye care facility in outreach programs

More than two-thirds (71%; n=68/96) of the participants indicated that the decision to refer people with diabetes in community-based screening programs to eye care facilities for management of DR is being made by ophthalmologists. Two-thirds (n=64/96) of the participants indicated that optometrists could also be involved in making the decision on referral of people with diabetes having DR to eye care facilities for management of DR.

Managing health information systems

Most (77.1%) of the participants reported that ophthalmologists manage health information systems to measure output and outcomes at eye care facilities. Similarly 58.3 % indicated that information systems for recall/follow-up are currently managed by ophthalmologists. Less than 9% of the participants indicated current roles for optometrists and other mid-level eye care workers in managing information systems. However, more than two-thirds (67.7%, including 39 doctors) indicated that optometrists and more than half (51%) suggested that

refractionists and ophthalmic technicians could also be involved in managing health information systems.

Eye examinations of people with diabetes on follow-up visits at eye care facilities

Almost all the participants reported that ophthalmologists do eye examinations of people with diabetes on follow-up visits in eye care facilities. However, 81% (including 41 doctors) of the participants suggested that optometrists could do eye examinations of people with diabetes but no DR, 66.7% and 59.4% suggested that optometrists could also undertake the eye examinations of people with mild non-proliferative diabetic retinopathy (NPDR) and with moderate NPDR respectively on follow-up visits.

Regarding eye examinations of people with severe NPDR on follow-up visits, almost half of the participants (51%) did not favour optometrists to share the task of eye examination of people with severe NPDR. Similarly, all the participants suggested that ophthalmologists should continue eye examinations of patients with PDR and diabetic macular edema.

Referral for low vision rehabilitation

Almost all the participants reported that ophthalmologists currently make referrals for low vision rehabilitation at their eye care facilities. Approximately one-third (35/96) of the participants indicated that optometrists also perform this role. However, this increased to more than two-thirds (63.5% to 89.6%) suggesting that optometrists and refractionists could

perform this role while less than 30% participants indicated involvement of other mid-level eye care workers.

Supervision of eye care workers

Ophthalmologists remained the recommended cadre to undertake the supervision role. However, 77% (n=74/96; including 37 doctors and 26 optometrists) of the participants suggested that optometrists could share in the supervision of eye care workers to reduce the burden on ophthalmologists.

Proposed Task Sharing Model

Responses from the participants to the survey provided evidence to develop a checklist for the potential task sharing model. Each task has been assigned to the cadres on the basis of at least 50% of participants in the survey suggesting that such tasks be undertaken by the specific cadre. Table 2 shows the proposed task sharing model. Very few participants suggested involvement of orthoptists for any activity in the checklist so they were excluded from Table 2. Since different low resource countries have a variety of cadres for eye and health care services with respect to screening and detection of DR, decisions on which cadre is assigned the responsibility for specific tasks needs to be made at the country level based on:

- Available human resources for eye care for people with diabetes
- Health policy of the country
- The service delivery model in that country
- Their basic and DR-related training
- Roles for eye care workers

[Table 2]

DISCUSSION

This research provided an analysis of the role of various cadres such as the involvement of optometrists and mid-level eye care workers in eye care facilities in limited task sharing activities including health education, refraction and non-mydriatic retinal photography. The respondents think that a task sharing model as suggested in this research could expand the workforce roles to support ophthalmologists and to increase access for people with diabetes to eye care delivery. Optometrists, refractionists, ophthalmic technicians, diabetes educators and LHWs are considered to be the appropriate workforce who could be involved

in specific task sharing activities for DR screening depending upon the availability of the cadre.

Health education is one of the potential areas for task sharing and available cadres can be assigned new roles related to DR education and awareness. The study demonstrated the roles of LHWs and diabetes educators in Pakistan to educate people with diabetes about DR and related risk factors. Similarly, LHWs can play a role in identifying high risk people with diabetes along with their routine house to house visits for mother and child health care. The recommendations of various cadres for health education in this study were similar to the role of LHWs in mother and child health education in Pakistan [16, 17] and the Aravind Eye Hospital (AEH) and the LV Prasad Eye Institute (LVPEI) models where health education is provided by trained community health workers selected from the same community [18, 19].

The tasks of screening people with diabetes for detecting DR using non-mydriatic retinal photography was also considered as a primary level task, which can be performed by a mid-level eye care worker with adequate training. These findings are supported by the LVPEI model that initiated screening of DR in vision centres and in the community by using a low-cost non-mydriatic fundus camera [20]. Initially, that pilot project was implemented in one village vision complex in Hyderabad in India and over 25 vision technicians were trained [20].

Technologies such as tele-ophthalmology with the setting up of reading centres for grading DR in a tertiary eye care facility could reduce the requirement of ophthalmologists in outreach programs and expedite the process of screening. The respondents in this research

suggested that mid-level eye care workers can take retinal images in screening programs. These images could be sent to the reading centres where trained optometrists or ophthalmologists can examine images and give advice to patients and mid-level eye care workers about management plans. Such a program is already in practice in India [21].

When it comes to barriers in effective service delivery for people with diabetes and DR, the absence of a sophisticated health information management system, record keeping and patient referral system can be deemed as one of the significant factors [22, 23]. To improve the service delivery system in Pakistan, the availability of an effective health information system is crucial. This research demonstrated that ophthalmic technicians and refractionists could be trained to gain competency to maintain a health information system and arrange follow-up eye examinations for at-risk patients to ensure continuum of care.

The proposed task sharing approach is not simply to expand the role of optometrists and mid-level eye care workers, but to formulate a collaborative setting and integrated model in which all cadres can work together in harmony. As demonstrated in this research, ophthalmic technicians and refractionists could share tasks with optometrists to provide them time to share some tasks with ophthalmologists. Four year graduated optometrists could be enabled with training to support ophthalmologists in basic eye examinations and diagnostic procedures. Routine tasks such as assessment of vision and refraction performed by optometrists in Pakistan are undertaken by vision technicians in LVPEI and AEH models [24]. In other examples from the USA, UK [25, 26], Canada [27] and Australia [28], optometrists can

prescribe therapeutic agents for certain eye conditions and mid-level eye care workers are engaged in screening programs. This illustrates that a retina specialist or ophthalmologist is not needed every time to examine every patient who comes for any eye-related issue and optometrists also can undertake screening procedures, referrals and follow-up.

This research demonstrated that task sharing can create the opportunities to addresses the HR shortage and ensures that people with diabetes have access to coordinated, continuous and high quality eye care to prevent vision loss due to DR. However, task sharing should not be viewed as a panacea for the shortage in the number of ophthalmologists but must be part of an overall strategy in an effective health system. The tasks identified and recommended in Table 2 should be implemented according to a standardized training, compensation, and supervision plan. As demonstrated in an earlier part of this research, pre-service and in-service training is mandatory for a successful task sharing framework[11].

CONCLUSION

This research provided an insight on how task sharing in DR management can be implemented by optimizing the roles of eye care workers. However, future research on task sharing should consider examining the effectiveness of this practice across health facilities or organisations which have implemented it.

Contributors

Mufarriq shah contributed to the conception and design of the study, acquisition of data and analysis and interpretation of data, drafting the article and final approval of the manuscript. Ayesha Noor and Gail M Ormsby contributed to data entry, drafting of the manuscript and revising of the manuscript; Fakir Amirul Islam contributed to the conception and design of the study, data analysis and revising of the manuscript; C Alex Harper and Jill Elizabeth Keeffe contributed to the conception and design of the study and revising of the manuscript. All co-authors approved the final version of the manuscript.

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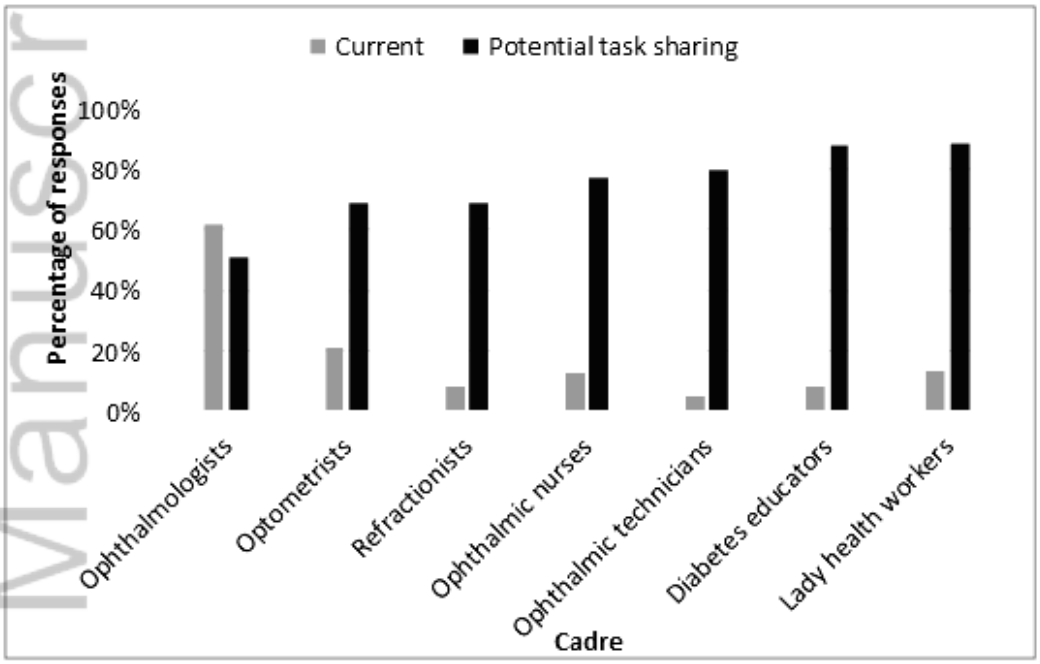

Figure 1: Comparison of responses on current and potential provision of education on diabetes control and risk factors

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Table 1: Demographics of participants

Characteristics			Number (%)
Respondent categories(n=96)	Doctors(58%, n=56)	Dean/ Administrators	10 (10.4)
		Ophthalmologists	37 (38.5)
		Diabetologists	9 (9.4)
	Optometrists		29 (30.2)
	Mid-Level Eye Care Workers		11 (12%)
Sex	Male		74 (77%)
	Female		22 (23%)
Age group	Less than 30 years		19 (19.8)
	30 to 39 years		29 (30.2)
	40 to 49 years		21 (22)
	50 years and above		27 (28)
Job experience	1 to 5 Years		24 (25)
	6 to 10 Years		19 (20)
	11 to 15		11 (11.5)
	More than 15 Years		42 (44)

Table 2: Proposed task sharing model

TASKS	CADRE							
	Doctor	Ophthalmologist	Optometrist	Refractionist	Ophthalmic nurse	Ophthalmic technician	Lady / community health worker	Diabetes educator
Education on diabetes control and risk factors (obesity, diet, smoking, life style)	●	●	●	●	●	●	●	●
Education on prevention of vision loss from DR	●	●	●	●	●	●	●	●
Education on DR treatment	●	●	●	●	●	●	●	●
Education on management of hypertension and lipid abnormalities	●	●	●	●	●	●	●	●
Vision testing		●	●	●	●	●	●	●
Refraction		●	●	●	●	●		
Non-mydriatic retinal photography			●	●	●	●		
Mydriatic retinal photography		●	●	●		●		
Fluorescein fundus angiography		●	●	●		●		
Slit lamp bio-microscopy		●	●					
Tonometry		●	●	●		●		
Dilated ophthalmoscopy	●	●	●					
Grading of DR	●	●	●					
Referral for management of DR in outreach programs	●	●	●	●				
Information system to measure outcome and compliance		●	●	●		●		
Information system for recall/follow-up		●	●	●	●	●		
Referral for low vision rehabilitation		●	●	●				
Diabetes but no DR		●	●					
Mild, moderate NPDR		●	●					
Severe NPDR, PDR and DME		●						
Timing for follow-up of laser treatment		●	●	●				
Supervision of eye care workers		●	●					

Legend: ● = Current roles of eye and health care workers in assessment and management of DR

○ = Tasks that could be performed with additional training and resources