

Appendix A: Analysis of Workflow Components of the Diabetic Retinopathy Screening (DRS) and Referral Process

INTRODUCTION

An analysis of workflow components of the process involved in diabetic retinopathy screening (DRS) and referral to Ophthalmology was conducted on a subset of patients with vision-threatening diabetic retinopathy (VTDR) referred to the Ophthalmology Clinic at Riverside University Health System (RUHS) in order to identify where the delays in fulfilling the referrals occurred. Understanding this process was considered an essential step toward improving its quality and efficiency.

METHODS

The following intervals and workflow components were identified through interviews with Family Care Center (FCC) staff and by direct observations of the process: (Figure A1)

Interval 1: Time from DRS until receipt of the DRS Consultant Report by photographer

- Component A, DRS: Capture of retinal images and upload to the DRS data base.
- Component B, DRS Report: Evaluation of retinal images remotely by certified DRS consultants and transmission of Consultant Report to the photographer in the clinic.

Interval 2: Time from receipt of DRS report until Primary Care physician's (PCP's) submission of a referral to Ophthalmology

- Component C, Referral to Ophthalmology: submission of referral to Ophthalmology by PCP.

Interval 3: Time from PCP's submission of referral until patient attends the first Ophthalmology visit

- Component D, Contact patient with referral: PCP informs patient of DRS result and referral recommendation.
- Component E, Insurance authorization: Central Provider Relations office at RUHS authorizes patient for referral.
- Component F, Schedule appointment: Ophthalmology Clinic schedules appointment and informs patient.
- Component G, Ophthalmology visit: Patient keeps first Ophthalmology appointment. Ophthalmology Clinic Staff attempts to contact patient if an appointment in the Eye Clinic is missed.

Data were not available to document the timing of components D, E, F separately.

Documentation of these 3 intervals of the referral process was available only for the subset of patients screened in 2017, when the EMR was fully operational. (The paper charts did not contain information regarding the date of referral to Ophthalmology.)

RESULTS

There were 111 patients screened and referred for VTDR in 2017. The 2017 subset was similar to those screened and referred with VTDR in 2015-2016 (n=150) with regards to age and gender distribution. There were more patients in 2017 with diabetes duration >20 years (23% vs. 15%) and more females (52% vs. 47%) compared to 2015-2016. The adherence rates for keeping a first Ophthalmology appointment within one year of the DRS were similar in the two subsets: 63/109 (58%) in 2017 vs. 82/150 (55%) in 2015-2016. The median Adherence Interval for keeping a first Ophthalmology

appointment for patients screened in 2017, was 97 days compared to a longer interval of 126 days in 2015-2016.

The results for patients' keeping a first Ophthalmology appointment within one year of the DRS is shown graphically in Figure A1. The median values for workflow intervals for all VTDR patients referred in 2017, as well as for several subgroups, subdivided by adherence status, are shown in Table A1. The median value for Interval 1 was short (within one day) in all subgroups, and thus contributed minimally to the overall Adherence Interval. The median value for Interval 2 varied little among subgroups (12-14 days). The median value for Interval 3, on the other hand, was considerably longer (396 days), in patients with Adherence Intervals greater than one-year compared to patients with Adherence Intervals less than, or equal to, one year (60 days). Interval 3 was both the largest contributor to the Adherence Interval and the most complex. It included the times required for: informing the patient of the referral; insurance authorization for referral; scheduling the appointment in Ophthalmology; and patients' keeping the appointment.

Table A1. Workflow Components for year 2017 Patients

PATIENT GROUP	Interval 1 (days) median (range)	Interval 2 (days) median (range)	Interval 3 (days) median (range)	Adherence Interval ^a (days) median (range)
All VTDR Patients	0 (0-16) n=109	14 (0-446) n=98	70 (0-633) n=62	97 (0-649) n=72
Patients without First OPHTH APPT	0 (0-10) n=37	12 (1-73) n=26	no first OPHTH APPT	no first OPHTH APPT
Patients with FIRST OPHTH APPT ≤/= one year	0 (0-16) n=63	14(1-189) n=63	60 (0-303) n=63	84 (0-320) n=63
Patients with First OPHTH APPT > one year	0 (0-3) n=9	12 (5-446) n=9	396 (9-633) n=9	487 (371-649) n=9

VTDR, vision-threatening diabetic retinopathy; OPHTH APPT, Ophthalmology appointment.

^a Adherence Interval, time from date of DRS to date of first Ophthalmology appointment.

There were 11 patients screened and recommended for referral in 2017 who had no Ophthalmology referral posted in the EMR. None of these patients had kept a first Ophthalmology appointment within one year of the DRS, and represented 10/37 (27.0%) of patients with no kept first Ophthalmology appointment. These patients had been sent for screening from the Family Care Center, the Internal Medicine Clinic, and the satellite community health centers. Repeat review of the EMRs revealed no explanation for the absence of a documented Ophthalmology referral.

DISCUSSION

The results of the interval analysis showed that the processes of transmitting, evaluating and reporting the results of the retinal images (Interval 1) were working efficiently, and did not contribute significantly to the Adherence Interval for keeping a first Ophthalmology appointment.

The submission by the PCP of a referral to Ophthalmology after the clinics receives the DRS report (Interval 2) should be amenable to quality improvement. The lack of a PCP-generated Ophthalmology referral in the EMR for 11 of the patients in 2017 probably occurred as an administrative oversight. It is

unlikely that there was any systematic bias in omitting these patients. This finding demonstrates that while electronic access to medical records can improve communications between PCPs and specialists and improve the quality of care,[1] fail-safe processes for making and tracking referrals are still needed.

The largest component of the Adherence Interval was Interval 3. In order to elucidate the relative contribution of each component of Interval 3 to the overall adherence delay, and to improve the quality of the process, tracking patients through the entire referral process is needed. For instance, in the safety net population, insurance authorization can be a particularly lengthy process, and, as well, patients can lose their insurance coverage from month to month. Lack of, or uncertainty about, insurance coverage has been shown to be one significant correlate to non-adherence among DRS patients referred to Ophthalmology for VTDR.[2] However, the findings reported in Appendix B of the present study suggest that increasing insurance coverage by itself is insufficient to improve referral adherence. It may require broader reforms in the health system nationally, with amelioration of health disparities within poorer socioeconomic groups, to actually improve health care processes, and, ultimately, health outcomes.

The results of the workflow analysis in the present study have been used to help redesign the workflow of the diabetic retinopathy screening and referral processes in the Primary Care clinics at RUHS. The effects of implementing these changes on the various adherence measures is the subject of ongoing studies.

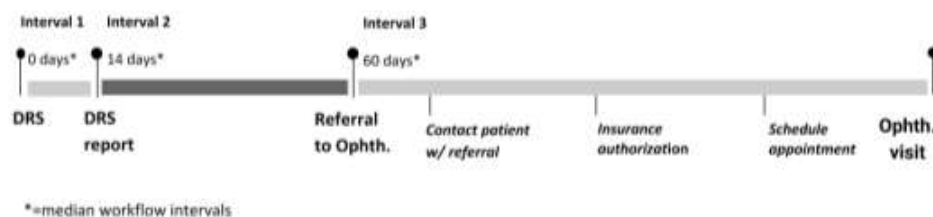
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2. Shi Q, Zhao Y, Fonseca V, et al. Racial disparity of eye examinations among the U.S. working-age population with diabetes: 2002-2009. *Diabetes Care* 2014;37: 1321-8. doi: 10.2337/dc13-1038. Epub 2014 Feb 26.

FIGURES

Figure A1. Workflow components of diabetic retinopathy screening (DRS) process. Median values are for patients who were screened in 2017, and who kept a first Ophthalmology appointment within one year of the DRS.

Workflow components for patients screened in 2017 and keeping a first Ophthalmology appointment within one year



DRS, diabetic retinopathy screening
Ophth., Ophthalmology