Clinical Ophthalmology

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ORIGINAL RESEARCH

Evaluation of Routine Clinical Deployment of an Autonomous Artificial Intelligence Assistant for Cataract Follow-Up in the National Health Service

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Purpose: To understand the efficiency, safety, and patient acceptability of using an artificial intelligence-based conversational agent Dora R2 (Ufonia Limited, UK) in the cataract pathway.

Patients and Methods: This mixed methods cohort-based service evaluation included both prospective and retrospective data collection from two UK public hospitals: Oxford University Hospitals National Health Service (NHS) Foundation Trust and Buckinghamshire Healthcare NHS Trust. Patients undergoing cataract surgery of mixed complexity were included. All patients who had postoperative calls with Dora R2 between October 2022 and April 2023 were included. Dora R2 calls patients three weeks after routine cataract surgery to assess symptoms and answer patient queries. Patient demographics and clinical outcomes were reviewed, and statistical analyses were performed to identify any differences based on age, gender and ethnicity.

Results: Of 1580 eligible patients, 1269 (78%) completed the Dora R2 call. About 767 (63%) had "no clinical concerns" identified by Dora. The median patient age was 77 years, with 84% identifying as white. There were no significant differences in call outcomes based on demographic factors (at 5% significance level). The Net Promoter Score for patient acceptability was 47, indicating high satisfaction. Regarding safety, only 0.3% of patients required unplanned management changes within two weeks of a Dora call with a "no concerns identified" outcome.

Conclusion: Dora R2 effectively supports postoperative follow-up for cataract surgery, demonstrating high efficiency, safety, and patient acceptability. The technology successfully supports clinicians in identifying uncomplicated cases, reduces the need for clinician-led consultations, and does not exacerbate digital inequalities, showing promise for broader implementation.

Plain Language Summary: Cataract surgery is one of the most common operations worldwide. After surgery, patients typically need a follow-up appointment to check their recovery. However, with increasing demand for cataract surgery and limited National Health Service (NHS) resources, finding enough staff to conduct these follow-ups is challenging.

We tested whether an automated telephone assistant called Dora could safely and effectively follow up patients after routine cataract surgery. Dora calls patients three weeks after their operation, asks about their symptoms and recovery, and answers common questions. Based on the conversation, Dora identifies patients who are recovering well and those who may need further assessment from a clinician.

We studied 1636 patients across two NHS hospitals. Of those who spoke with Dora, 63% were recovering well with no concerns, meaning they did not need a follow-up call from clinical staff. Patients were highly satisfied with the service, giving it a recommendation score of 9 out of 10. Importantly, Dora worked equally well for patients of all ages, genders, and ethnic backgrounds – addressing concerns that digital healthcare tools might disadvantage certain groups.

The system was also safe. Only 0.3% of patients identified as having "no concerns" later needed unexpected treatment.

https://doi.org/10.2147/OPTH.S576990
Received: 20 November 2025
Accepted: 7 March 2026
Published: 17 April 2026

These findings suggest that automated telephone follow-up can help the NHS manage the growing demand for cataract surgery without compromising patient safety or experience. This frees up clinical staff to focus on patients who need more complex care, while ensuring all patients receive timely follow-up after their surgery.

Keywords: post operative follow up, telemedicine, cataract surgery, digital health equity

Introduction

Cataract surgery is one of the most common operations globally, with an estimated 20 million procedures performed per year and projected increases in line with the ageing population.[1] In the United Kingdom (UK), The Royal College of Ophthalmology, Getting it Right First Time (GIRFT) and the National Institute of Health and Care Excellence (NICE) have all issued guidance on how to improve patient care, whilst also giving efficiency and cost savings. NICE recommends that there should be a process to identify complications after surgery and ensure that there is prompt access to specialist ophthalmology services and arrangement so that second-eye surgery can be discussed.[2]

Postoperative pathways for routine cataract surgery vary between NHS units. Some centres use telephone-based follow-up, where a clinician calls the patient to assess symptoms and arranges face-to-face review only if concerns are identified. Increasingly, patients undergoing uncomplicated surgery are discharged without a scheduled follow-up appointment; instead, they are advised on warning symptoms and instructed to contact the hospital only if these occur. Generally, patients are recommended to attend their community optometrist for a routine sight test at 4–6 weeks postoperatively. Face-to-face hospital review is generally reserved for complex cases. Each of these pathways requires either trained clinical staff time or relies on patient-initiated contact, which may delay identification of complications.

Telephone follow-up after surgery is already a well-accepted method, with evidence showing safety and the ability to identify patients with postoperative issues based on their symptoms.[3,4] More recently, telephone follow-up using an automated telephone assistant (Dora R2, Ufonia UK) has been able to support clinicians in identifying those patients with potential clinical concerns. This technology is a UK Conformity Assessed (UKCA) medical device and has shown high patient acceptability,[5] and evidence of safety and efficiency when used to support cataract follow-up assessments in clinical trials.[6] Patients are suitable for follow-up with Dora only if they meet predefined inclusion criteria: age 18 or older, having undergone uncomplicated cataract surgery, and able to have a phone conversation in English. Patients are excluded if there is any urgent clinical concern requiring immediate review, or if they have significant communication impairment.

Although artificial intelligence (AI) technology has great potential in ophthalmology, it is often difficult to transition from research into clinical practice.[7] There are also concerns regarding inequality with digital solutions, particularly related to age and ethnic minorities.[8,9] Here we report the results of a service evaluation, designed to assess the success of deployment of automated telephone follow-up with Dora R2 in two National Health Service (NHS) hospitals in the UK. The technology was deployed to deliver high-quality routine follow up to patients at scale with a fraction of clinical time. We wanted to assess the breadth of patients that could successfully use the technology and ensure we were not implementing technology that could exacerbate digital inequality. We also evaluated the efficiency, safety, and acceptability of the current model of delivery and how this could be improved.

Materials and Methods

This was a service evaluation involving patients from two NHS hospitals in South East England: Oxford University Hospitals NHS Foundation Trust (OUH; registered audit ID: 8175) and Buckinghamshire Healthcare NHS Trust (BHT; registered audit ID: PCG138). Service evaluations do not require Research Ethics Committee approval in the UK, as per NHS Health Research Authority guidance. The study was conducted in accordance with the principles of the Declaration of Helsinki. All patients who received a postoperative call with Dora R2 during the first seven months of implementation at both sites were included (October 2022–April 2023 at OUH and March 2022–September 2022 at BHT).

BHT performs high-volume cataract surgery in a dedicated modular unit. Prior to implementation of Dora R2, every patient had a nurse or doctor-led follow-up call and face-to-face review was arranged as necessary. OUH is a tertiary care unit where patients undergo cataract surgery at three clinical locations. At OUH, before Dora R2 was implemented,

approximately two-thirds of patients were discharged to the community optometrist on the day of surgery and one third had planned face-to-face review.

Both clinical sites transitioned to use Dora R2 as the standard of care for follow-up. Any patient who had routine surgery and was able to have a conversation in English was eligible for follow-up with Dora R2. At BHT, clinicians request follow up with Dora after the surgery is completed on the operation note. At OUH, the clinician listing the patient for surgery ticks the Dora follow-up box on the listing form if they feel the method would be suitable for the patient. Additionally, patients can be listed for Dora follow up by the clinician on the operation note. Any patients with concurrent ophthalmic conditions (eg. glaucoma or diabetic retinopathy) who were already under ophthalmology care continued their usual follow-up pathway after cataract surgery.

Dora R2 telephones the patients 3 weeks after routine surgery and asks key symptom questions to understand their surgical recovery and gives the patient the opportunity to ask questions. Dora R2 then discusses second eye surgery preferences if applicable. If a patient does not answer the initial call attempt, Dora R2 will call the patients at another time on any listed numbers (mobile phone or landlines).

To assess acceptability, all patients were asked by Dora "On a scale of 1 to 10, how likely would you be to recommend this automated system to a friend or a colleague?".[10,11] The overall Net Promoter Score (NPS) is calculated by subtracting the percentage of detractors (scores below 7) from the percentage of promoters (scores 9 or 10). The score can range from −100 to +100, with scores of 50 or higher considered excellent.[12] Patients were also invited to leave a free text comment to explain why they gave each score.

Ufonia Ltd uses a quality assurance process prior to the Dora call outcomes being returned to the hospital. Quality assurance is a trained "human in the loop" who undergoes pathway-specific training for the types of intents (a set of expressions that mean the same thing but are constructed in different ways) that Dora has been designed to understand. This provides Ufonia with continuous local validation and post-market surveillance data, required to meet the requirements of medical device certification. Quality assurance for any given call happens in a fraction of the time of a human-led phone call, and there are various proprietary mechanisms in place to help flag calls that may require more urgent review. At the time of this evaluation, at least 10% of the calls were quality assured.

Based on the patient's conversation with Dora R2, the hospital receives a report summarising the conversation and two key outcomes are generated: 1) "no concerns identified" or 2) "potential concerns". Patients are identified as having potential concerns if they have significant red or painful eyes, new floaters or flashing lights, or concerns with their vision or if they have questions that cannot be answered by Dora R2. At both BHT and OUH, a clinician reviews the summary report and those patients with "no clinical concerns" identified by Dora are either discharged or listed for their second eye surgery (if requested on the call and the clinician feels this is appropriate after review of their medical record). Those patients with "potential concerns" are called back by a clinician within 48 hours. The hospital sites had a "did not answer" policy akin to a booked clinic appointment. If patients did not answer, their notes were assessed and the majority discharged.

A summary of the pathway is shown in Supplementary File 1. At both sites, patients are advised they can see their community optometrist for a sight test 6 weeks after their surgery. If there are urgent concerns, patients are advised to call eye casualty and a review will be arranged as required.

A list of patients who had calls with Dora R2 was generated from the Dora R2 platform. A retrospective review of the electronic clinical records (Medisoft and Cerner at OUH, and Medisight and Evolve at BHT) was performed to match key clinical and demographic information. To assess inequalities, we captured age, gender and ethnicity. We also collected whether this was the first or second eye surgery as this has been associated with different patient experience.[13] Clinical factors predisposing patients to increased risk of postoperative vision loss and complications were collected, based on previously published risk factors.[14,15] Ophthalmic clinic attendances were recorded to identify any unexpected presentations. A 3-month period after surgery was selected to capture the most common postoperative complications.[16] Unexpected management changes (UMCs) were defined as any change to topical treatment excluding lubricants, or additional follow-up appointments required. Serious risk of harm was defined as any urgent procedure or surgery required (eg. laser for retinal tear, tap and injection for endophthalmitis, corneal scrape for ulcer, or oral/intravenous pressure control medication). For those patients with a UMC detected during this evaluation, the call between Dora and the patient was listened to, and the symptoms described by the patient were noted.

Data was managed in Microsoft Excel, and descriptive statistics were used for the baseline demographics. Proportion was used for categorical data, mean with standard deviation for parametrically distributed continuous data, and median with interquartile range for non-parametric data.

Chi-squared $\chi 2$ test was used to identify if there were any statistically significant differences in the call outcome based on known factors influencing equality of access (age, gender, ethnicity, and 1st/2nd eye status). A two-tailed significance threshold of 0.05 was used throughout the analysis. A Ridge logistic regression analysis was also used to assess any correlation between patient factors and Dora call outcomes.

Results

Across both clinical sites, 1636 Dora R2 consultations were included. The baseline characteristics of the patients are shown in Table 1. The median age of patients was 77 years (IQR 71–82), with the oldest patient aged 99 years, representative of the normal cataract population in the UK and Europe.[17,18] About 985 (60%) of patients were female, and 885 (84%) were white Caucasian ethnicity.

Patients had a range of coexisting ocular comorbidities as shown in Figure 1. A total of 1263 (77%) patients had surgery under topical/intracameral anesthesia. At BHT, 131 (14%) had a toric intraocular lens, and across both sites, 1578 (96%) patients had an emmetropic refractive aim. At BHT, standard postoperative treatment was guttae chloramphenicol qds for 2 weeks and guttae dexamethasone 0.1% qds for 2 weeks then bd 2 weeks. At OUH standard treatment was guttae dexamethasone 0.1% qds for 4 weeks. Topical non-steroidal anti-inflammatory (NSAIDs) were offered to those at increased risk of cystoid macula oedema (eg. those with diabetes or uveitis).

In this population, 427 (27%) patients had at least one factor that would increase the risk of postoperative complication or suboptimal visual acuity (Figure 1). The most common risk factors were brunescent cataract 142 (9.0%), glaucoma 82 (5.2%), and diabetic retinopathy 81 (5.1%).

Table 1 Baseline Characteristics of Patients Listed for a Dora R2 Call

Demographics	BHT	OUH	Total
All included patients (n)	964	672	1636
Age			
Median (Range)	77 (30–99)	77 (36–96)	77 (30–99)
IQR	71 - 82	71 - 83	71 - 82
Mean (SD)	76 (9.02)	76 (9.39)	76 (9.17)
Eye			
First Eyes (%)	444 (46)	413 (61)	857 (52)
Immediate bilateral surgery (%)	14 (1)	0 (0)	14 (1)
Number of patients that had surgery on both eyes during period (%)	219 (23)	43 (6)	262 (16)
Toric lens used (%)	131 (14)	3 (0)	134 (8)
Emmetropic aim (%)	935 (97)	643 (96)	1578 (96)
Anaesthetic type			
Subtenon (%)	244 (25)	64 (10)*	308 (19)
Topical/intracameral (%)	719 (75)	544 (81)*	1263 (77)
Sedation/GA (%)	1 (0)	64 (10)*	65 (4)
Gender			
Number male (%)	379 (39)	272 (40)	651 (40)
Number female (%)	585 (61)	400 (60)	985 (60)
Ethnicities			
White (%)	885 (92)	489 (73)	1374 (84)
Asian (%)	48 (5)	23 (3)	71 (4)
Black (%)	29 (3)	8 (1)	37 (2)
Other/not listed (%)	2 (0)	152 (23)	154 (9)

Note: *percentages total over 100% due to rounding.
Abbreviations: BHT, Buckinghamshire Healthcare Trust; GA, general anaesthetic; IQR, interquartile range; OUH, Oxford University Hospitals NHS Foundation Trust; SD, standard deviation.

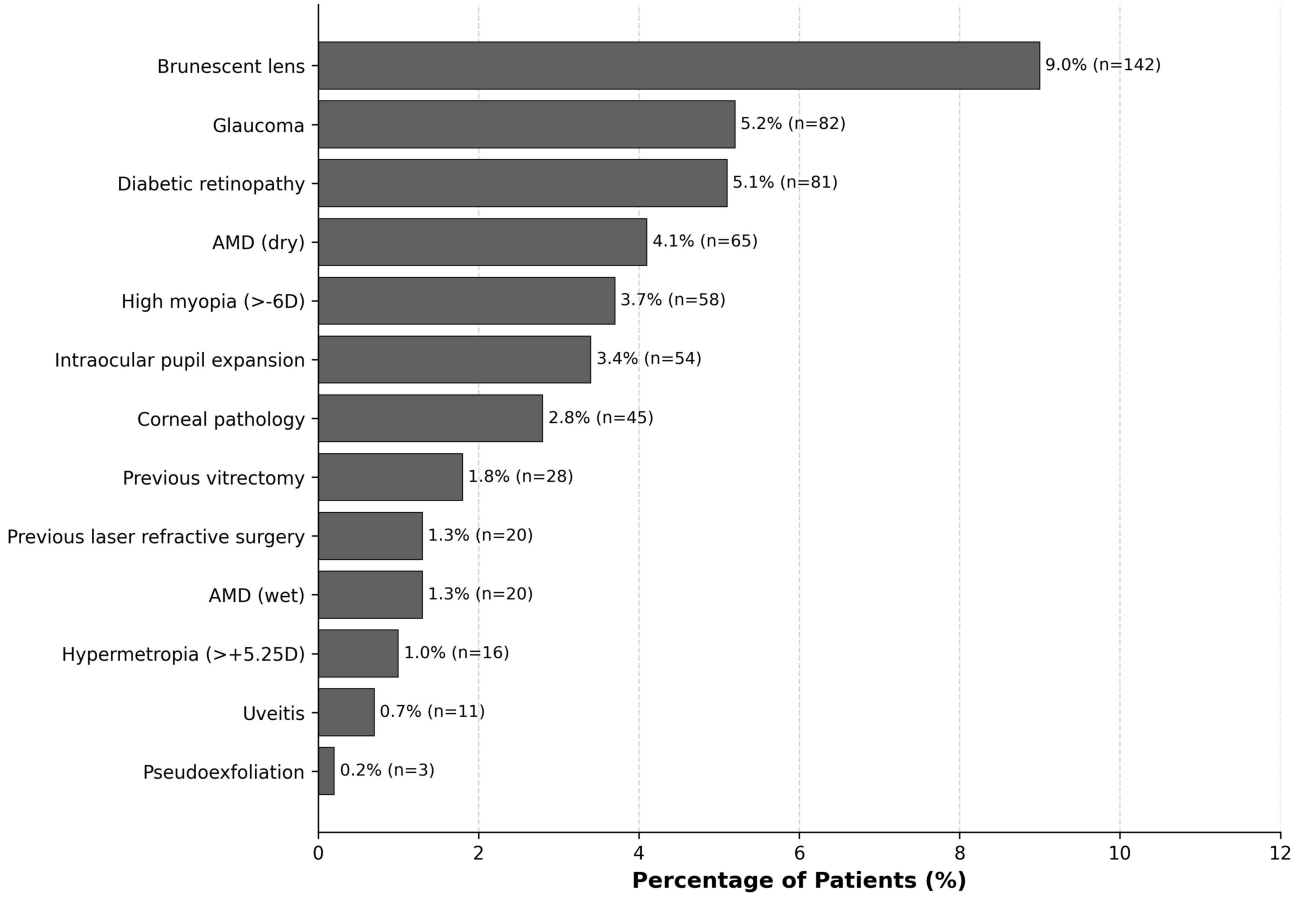

Figure 1 Proportion of patients with ocular risk factors for increased postoperative complication or suboptimal vision. Percentages represent the proportion of total patients (n=1636).
Abbreviations: AMD, age-related macular degeneration; D, dioptre.

Efficiency

Of the 1636 patients listed for Dora R2 calls, 1580 (97%) were eligible. The most common reasons for ineligibility were patients who had complex or combined surgery, patients that were unable to have a conversation with Dora due to language difficulties, and cognitive or hearing impairment. Of the 1580 eligible patients that Dora contacted, 1358 (86%) answered, and 1213 (89%) of these completed the call. Overall, 767 (63%) of patients that answered their calls with Dora R2 had no clinical concerns (Table 2). This is the cohort that typically clinicians are able to list directly for second eye cataract surgery or discharge to the community.

The outcomes for patients with an incomplete or "potential concerns" outcome are shown in Supplementary Files 2 and 3.

Equality

We compared the Dora call status for each subgroup to understand if there were any significant differences in Dora call usability by ethnicity, gender, age, and whether this was first or second eye surgery (Table 3). Chi-squared tests of independence were performed to examine the relationship between different variables and Dora outcomes. There was no significant difference in the proportion of patients with each outcome based on ethnicity (chi^2 9.90, degrees of freedom (df) 6, p=0.129), gender (chi^2 1.15, df 2, p=0.563, age bracket (chi^2 2.34, df 2, p=0.311), or eye status (chi^2 0.23, df 2, p=0.892).

Further analysis using the Ridge logistic regression model is shown in Supplementary File 4. Due to the relatively low numbers/rates in this cohort, caution should be taken when interpreting any meaningful associations using this method, as there is a risk of overfitting, and many factors/comorbidities are likely already correlated.

https://doi.org/10.2147/OPTH.S576990

Table 2 Patient Flow Through the Dora R2 Follow-Up Pathway

Patient Detail	BHT	OUH	Total
All patients having cataract surgery in period	2581	1625	4206
Patients in BHT modular unit (n) (% of all having surgery at BHT)	1137 (44%)		
Patients listed for Dora call (n) (% of all patients having surgery)	964 (37%)	672 (41%)	1636 (39%)
(n) (% of all patients having surgery in modular unit)	964 (85%)		
Eligibility of patients listed for Dora calls			
Eligible	949 (98%)	631 (94%)	1580 (97%)
Complicated/combined surgery	14 (1%)	9 (1%)	23 (1%)
No access to phone	0 (0%)	2 (0%)	2 (0%)
Language difficulty	0 (0%)	11 (2%)	11 (1%)
Cognitive/hearing impairment	0 (0%)	17 (3%)	17 (1%)
Other	1 (0%)	2 (0%)	3 (0%)
Completion status of Dora calls (eligible patients)			
Unanswered calls (%)	132 (14%)	90 (13%)	222 (14%)
Answered calls (%)	817 (86%)	541 (86%)	1358 (86%)
Incomplete (% of answered)	87 (11%)	58 (11%)	145 (11%)
Incomplete (% of total)	87 (9%)	58 (9%)	145 (9%)
Calls completed (% of answered)	730 (89%)	483 (89%)	1213 (89%)
Call completed (% of total)	730 (77%)	483 (77%)	1213 (77%)
Outcome of completed calls (eligible patients)			
No concerns identified	437 (60%)	330 (68%)	767 (63%)
Potential concerns identified	293 (40%)	153 (32%)	446 (37%)

Abbreviations: BHT, Buckinghamshire Healthcare Trust; OUH, Oxford University Hospitals NHS Foundation Trust.

Table 3 The Proportion of Patients with Each Clinical Outcome Based on Ethnicity, Gender, Eye Status and Age

Demographic Factor	Patient Completed Dora Call	Patient Did Not Answer Dora Call	Patient Did Not Complete Dora Call	Chi-Squared Statistic	*df*	p
Ethnicity						
White	1039 (78%)	179 (13%)	119 (9%)	9.90	6	0.129
Asian	40 (63%)	16 (25%)	8 (13%)			
Black	25 (71%)	7 (20%)	3 (9%)			
Other/Not stated	109 (76%)	20 (14%)	15 (10%)			
Gender						
Male	488 (77%)	91 (14%)	52 (8%)	1.15	2	0.563
Female	725 (76%)	131 (14%)	93 (10%)			
Eye						
1st	636 (77%)	118 (14%)	73 (9%)	0.23	2	0.892
2nd	566 (78%)	98 (13%)	63 (9%)			
Age bracket						
Lower quartile	278 (74%)	52 (14%)	33 (9%)	2.34	2	0.311
Upper quartile	281 (69%)	71 (17%)	38 (9%)			

Abbreviations: *Df*, degrees of freedom; DNA, Did not answer.

Table 4 Numbers of Patients with "No Concerns" Identified on the Dora R2 Call, but Had Subsequent Planned, or Unplanned Reviews

Clinical Review Appointments	BHT	OUH	Total
Total eligible patients	949	631	1580
Patients with no concerns identified (n)	437	330	767
Numbers seen for telephone or F2F review in 3 months (% of all "no concerns")	68 (15.4%)	52 (15.4%)	120 (15.4%)
Numbers seen for F2F review in 3 months (% of all "no concerns")	32 (7.3%)	49 (14.5%)	81 (10.4%)
Planned review			
Number of planned reviews within 2 weeks of Dora call (% of all "no concerns")	5 (1.1%)	11 (3.3%)	16 (2.1%)
Of planned reviews, unexpected management changes (% of all "no concerns")*	0 (0.0%)	2 (0.6%)	2 (0.3%)
Unplanned reviews within 2 weeks of Dora call			
Unplanned reviews within 2 weeks of Dora call* (% of all "no concerns")	2 (0.5%)	3 (0.9%)	5 (0.6%)
Of these, had subsequent unexpected management changes (% of all "no concerns")	0 (0.0%)	2 (0.6%)	2 (0.3%)
Unplanned reviews (After 2 weeks)			
All unplanned review up to 3 months after Dora call (% of all "no concerns")*	14 (3.2%)	16 (4.7%)	30 (3.9%)
Of all unplanned reviews, had subsequent management change (% of all "no concerns")	5 (1.1%)	7 (2.1%)	12 (1.5%)

Note: *Case-by-case breakdown provided in Supplementary file 1.

Safety

To ensure that Dora R2 was not missing patients that had potential concerns, we looked specifically at those patients who had "no concerns identified" by the Dora R2 call. This is the cohort who would not routinely have a clinician-led follow-up call. Table 4 and Supplementary File 5 summarize the number of patients that presented either through planned or unplanned (eye casualty) clinics after their surgery and the reasons and outcomes at these presentations. Four patients had unexpected management changes within two weeks of a call with Dora R2 in which there were no concerns identified. Two of these patients attended a scheduled clinic appointment (planned reviews) and 2 presented directly to eye casualty (unplanned review).

The positive predictive value for a "potential concerns" outcome was 16.8% (75/446), reflecting the system's intentionally cautious design to minimise missed cases. The negative predictive value for a "no concerns" outcome was 99.5% (763/767), indicating that when Dora R2 identified no concerns, patients were highly unlikely to require clinical intervention.

On post-hoc review of the Dora calls of the patients who had an unexpected management change, all had reported good vision. For the patient with a retained lens fragment, on the call with Dora the patient explained their eye was white, not painful with good vision. The patient asked about photophobia, and Dora flagged the call as "potential clinical concerns". Rather than the automated Dora call itself, it was on Ufonia's human-led quality assurance process that this call was relabeled as "no concerns".

Patient Acceptability

Every patient was asked, "How likely would you be to recommend this automated system to a friend or colleague", which was used to derive a Net Promoter Score (NPS). A total of 1221 patients answered the recommendation question on the call with Dora R2 (85% of the 1414 that answered the Dora R2 call). The median score was 9 (IQR 8–10) with a modal score of 10. The calculated NPS was 47. The distribution of scores is shown in Figure 2.

Illustrative free-text comments from patients included: "I think it's an efficient way of doing it and the team get the feedback that they need without interrupting the day"; "It was very user-friendly for someone my age; it was easy to partake in"; and "It's nicer to speak to a person, but you've done very well".

Discussion

This retrospective service evaluation demonstrates the successful implementation of Dora R2 for automated follow-up after cataract surgery, both in a dedicated high-volume cataract surgical unit (BHT) and across multiple sites within a tertiary hospital trust (OUH).

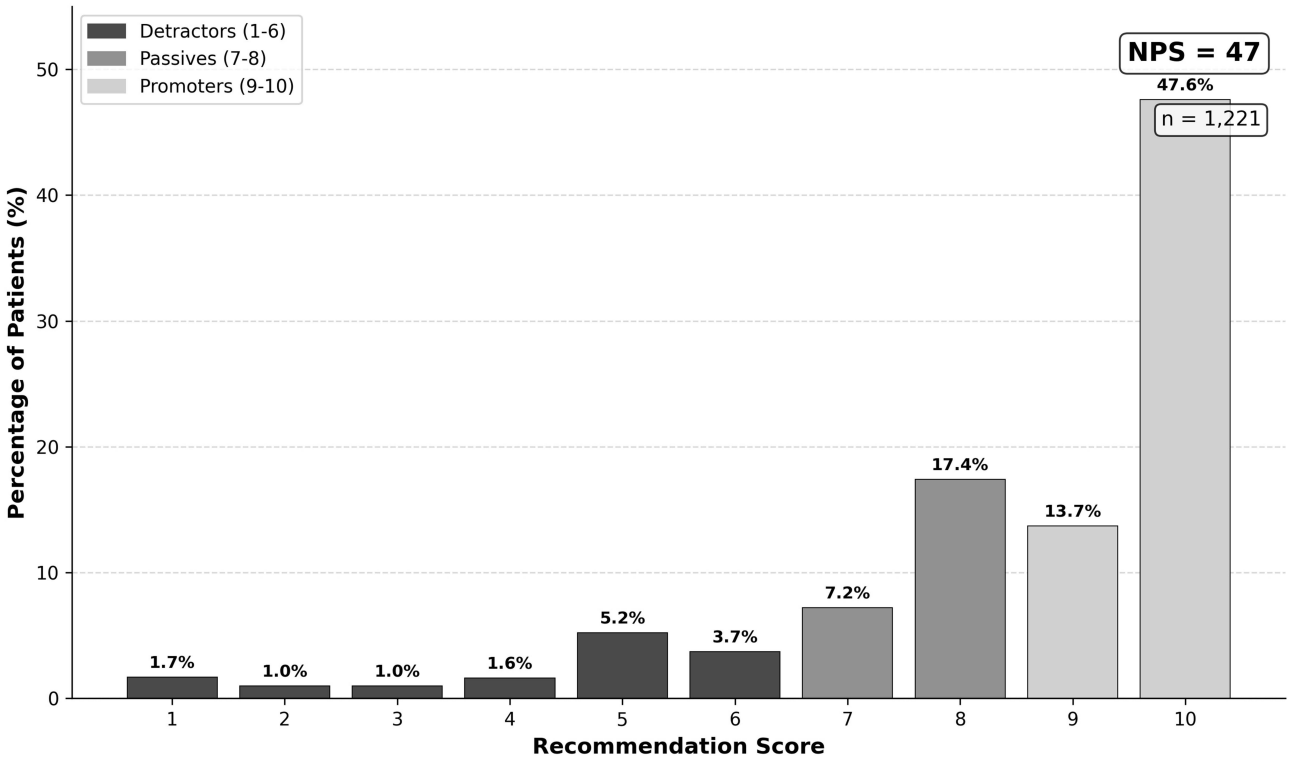

Figure 2 Net Promoter Score of Dora R2 calls. Distribution of patient recommendation scores for Dora R2 automated follow-up. Patients were asked "On a scale of 1 to 10, how likely would you be to recommend this automated system to a friend or colleague?" Scores are categorised as Detractors (1–6; dark grey), Passives (7–8; medium grey), and Promoters (9–10; light grey). The Net Promoter Score (NPS) is calculated as the percentage of Promoters minus the percentage of Detractors. n=1221 patients.

Dora R2 was effectively utilized by a diverse range of patients as part of the standard of care, including those with various ocular comorbidities. There was no evidence of digital inequality in this implementation as call outcomes did not vary significantly based on age, ethnicity, first/second eye status, or gender (although it should be noted that patients were only listed for a Dora call if they met set inclusion criteria). We hypothesize this is due to the simplicity of the technology – Dora does not require any special hardware or software understanding, it calls any telephone, allowing patients to speak normally. This is reflected in the high recommendation score from patients (median 9/10) from a population with a median age of 77 years.

Regarding safety, there were 5 (0.6%) patients who required an unplanned review within two weeks of a call with Dora, which identified no initial concerns. Of these, 2 (0.3%) experienced an unexpected management change. One patient with a retained lens fragment promptly presented to the hospital with new symptoms after their Dora call. The Dora call correctly identified potential clinical concerns, but a human-led quality assurance (QA) process incorrectly marked this as "no concerns". In response to this issue, Ufonia is refining the quality assurance protocols to incorporate automated safety checks alongside structured human oversight, which will help ensure more consistent accuracy.[19] The other patient had an epiretinal membrane preoperatively and presented with new visual concerns, subsequently undergoing an epiretinal membrane peel. Both patients presented promptly to the hospital when they had clinical concerns, aligned with the safety-net advice given by Dora during the call.

Considering efficiency, in this real-world deployment, patients who did not answer the Dora call were subsequently contacted by clinicians as part of routine care (Supplementary File 3). In line with standard outpatient protocols, patients who remain uncontactable after multiple attempts may be discharged from follow-up. Unlike traditional clinician-led calls, Dora offers greater flexibility by automatically attempting contact at different times of day, including evenings and weekends, and across multiple phone numbers where available. This increases the likelihood of successful contact without placing additional burden on clinical staff. Future deployments will also consider how best to manage patients who do not respond to calls, as this has implications for both the efficacy and safety of the pathway. In addition, future versions of Dora will support inbound calling, allowing patients to return missed calls, which may further enhance accessibility and engagement.

Regarding clinical concerns, Dora R2 identified 63% of patients with no clinical concerns, eliminating the need for further clinician-led telephone or face-to-face follow-up. Instead, outcomes could be reviewed, and patients either discharged or scheduled for second-eye surgery. Previous audits have shown postoperative complication rates of 6.3–11.4%,[20,21] suggesting that Dora currently identifies more patients as requiring review than are likely to have clinical concerns. This cautious approach reflects the system's design, which prioritizes patient safety by flagging cases where it cannot confidently interpret nuanced symptom descriptions. Some of these limitations stem from the challenges inherent in natural language processing, particularly when interpreting the varied ways in which patients describe their symptoms. However, as clinical input continues to guide model refinement and natural language processing capabilities advance, Dora's accuracy and specificity are expected to improve.

Nonetheless, Dora has already reduced the number of patients requiring routine human-led reviews, and a formal health economic evaluation is currently underway. Future development will also explore integration with electronic health records to enable more timely clinical decision-making.

This evaluation identified areas for improvement. The most common unexpected management change related to postoperative cystoid macular oedema (CMO). Patients were typically asymptomatic during the 3-week Dora call but later developed symptoms after discontinuing their postoperative drops. Since CMO typically presents at 4–6 weeks postoperatively,[22] future implementations could consider a second automated call at 6 weeks- an approach feasible with Dora as calls can be repeated without compromising clinical staff capacity.

Additionally, the case of the retained lens fragment highlighted a limitation in the quality assurance process: Dora correctly flagged the call as "potential concerns" based on the patient's mention of photophobia, but a human reviewer incorrectly reclassified it as "no concerns". This prompted Ufonia to update their QA training protocols. These learnings demonstrate the value of real-world deployment in identifying system improvements not apparent in controlled trial settings.

To maximise benefit from the technology, the departments are also streamlining the process of listing patients for Dora calls by automating the pathway from listing to call delivery. Future development will also explore Dora's integration with electronic health records and real-time data sharing, enabling more timely clinical decision-making.

Limitations

Retrospective Data Collection and Documentation Bias

The limitations of this service evaluation include the retrospective nature of the data collection, which relied on pre-existing clinical notes. As a result, some risk factors, such as dry age-related macular degeneration, or the presence of a brunescent lens, were not consistently documented in the health records. This incomplete documentation likely led to an underestimation of certain ocular comorbidities.

Digital and Language Inequalities

Although this evaluation found no evidence of digital inequality within the included cohort, this study's findings may not be applicable to all cataract patients due to its eligibility criteria. Patients who could not have a clinical conversation in English were excluded, which limits the generalizability of the findings to non-English-speaking populations. While the proportion of non-English speakers in the Oxfordshire and Buckinghamshire regions is relatively low, other regions of the UK with higher linguistic diversity may face greater disparities in access to this technology.

Future research should aim to recruit a more diverse sample in terms of ethnicity and language to assess Dora R2's adaptability across demographic groups and to explore its feasibility in multiple languages to widen its accessibility and reduce potential inequalities in care delivery.

Sampling Bias

The study population may be subject to sampling bias, as the decision to assign patients to Dora follow-up, face-to-face follow-up, or direct discharge to an optometrist was at the discretion of the operating surgeon. The factors influencing this decision, such as surgeon preference or patient suitability, were not systematically recorded, and this may have introduced variability in the included cohort. This evaluation included the first 7 months of deployment of the Dora

technology at each site, whilst surgical teams were not yet used to how patients would respond to Dora, and thus may have underutilized the Dora follow up pathway despite patients being eligible.

Patients with significant hearing impairments, cognitive impairments, or language barriers were excluded from Dora R2 follow-up. Although we are not able to provide data on the proportion of patients excluded due to language, cognitive or hearing impairment in this retrospective real-world audit, our previous prospective study also at OUH showed this proportion to be approximately 11% not recruited due to either hearing issues, language or cognitive issues.[6]

While the technology demonstrated significant utility for eligible patients, these exclusions mean that the findings cannot be extrapolated to the entire cataract patient population.

Limited Ethnic and Demographic Representation

The study cohort consisted predominantly of white Caucasian patients (84%), which does not reflect the diversity of the broader UK population. Although the median patient age of 77 years aligns with national cataract surgery demographics, the underrepresentation of minority ethnic groups limits the ability to draw conclusions about the technology's usability or effectiveness in these populations.

Data Collection Bias Related to Follow-Up Outcomes

The study relied on patients presenting to the operating hospital if they experienced postoperative concerns or complications. This approach may have missed patients who sought care at other hospitals or clinics, potentially underestimating postoperative complication rates.

A ground truth enabling sensitivity and specificity analysis was not collected in this study, which limits the ability to fully validate the findings. However, a previous study at OUH demonstrated an overall outcome sensitivity of 94% and specificity of 86% for Dora R2 when compared to clinicians.[6] This suggests that, while the retrospective design may have introduced biases, Dora R2 exhibits strong potential for accurately identifying patients requiring follow-up care.

Future studies should incorporate long-term follow-up and complication tracking across care settings to provide a more comprehensive evaluation of Dora R2's clinical utility and safety throughout the postoperative recovery period.

Conclusion

We have demonstrated that the natural language processing AI automated assistant Dora R2 can be effectively deployed as part of the routine clinical care pathway for the postoperative follow-up of cataract patients. In a world with an ageing population and an increasing demand for cataract surgery, AI automation offers a viable solution to scale up the care pathway without needing more highly trained clinical staff.

Acknowledgments

The project received grant support from the Small Business Research Initiative (SBRI) Healthcare Reset and Recovery Grant to Ufonia Limited, UK. KX is supported by the Wellcome Trust (216593/Z/19/Z) and National Institute for Health and Care Research (NIHR) Oxford Biomedical Research Centre (BRC).

This work has previously been presented at the following meeting:

American Society of Cataract and Refractive Surgeons, San Diego, US, May 2023.

Disclosure

Aisling Higham, Ernest Lim, Lisette Bijma, Louisa Stacey, Sarah Khavandi, James Thomas are employees of Ufonia Ltd. Mrs Lisette Bijma was employed by the Oxford Eye Hospital and then moved to Ufonia in March 2023 after completing her master degree. This research was part of her thesis. Nick de Pennington is director and shareholder of Ufonia Ltd. Sarah Khavandi reports grants from MPS, outside the submitted work. Sarah Maling is an advisor to Alcon, a Scientific Board Advisor to RevitalVision, an Education Board member for ESCRS and is an advisor to Ufonia and has received equity options and financial support to attend educational meetings. Michael Adams is an advisor to Ufonia and has received equity options and financial support to attend educational meetings. Rebecca Turner has received an honorarium

from Santen, BVI and Scope. Christopher King has received travel reimbursement from Ufonia and reports personal fees from Alcon, outside the submitted work. The authors report no other conflicts of interest in this work.

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