AMAZE™ Asthma Implementation Study
Clinical Study Report Synopsis

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2. PUBLICATIONS

None at the time of writing this report.

3. OBJECTIVES AND CRITERIA FOR EVALUATION

Table S1 Primary Objectives and Endpoints

Technology Outcomes
• How much is the platform utilized, and what is the perceived value by both clinical staff and patient users?
• How user-friendly is the platform?
• Are staff comfortable with the display and type of data shown?
• Which features are/are not useful to patients and clinicians?
• Which features need to be removed or improved?
• What, if any, bugs are encountered?
• How accessible is the app/portal?
• What is the optimal frequency for completing the patient log that is achievable and meaningful for asthma management?
Process Outcomes
• How does the implementation of AMAZE™ affect clinical process? For example, is patient communication improved, or is there an increase or decrease in time spent with patients?

Table S2 Exploratory Objectives and Endpoints

Clinical Outcomes
• How does the implementation of AMAZE™ affect clinical outcomes? For example, is there an increase or decrease in utilization of patient services, ER visits, or clinician contacts?
Key Patient Characteristics
• Identify patient segments that are most likely to benefit from using AMAZE™.

4. STUDY DESIGN

This was an implementation study to assess the feasibility, usability, perceived value, and potential benefits of integrating the AMAZE™ platform within two clinic systems. The AMAZE™ platform consisted of a clinician dashboard to guide treatment and asthma management, and a patient application (App) to enter daily symptoms and medications that can trigger alerts to the clinician dashboard. For this implementation study, the sites were trained to use the AMAZE™ platform.

After study launch, Evidera conducted qualitative, longitudinal, follow-up interviews regarding process implementation with a random selection of participants and site study staff (including coordinators and nurses) and site clinicians. This was done at Months 1 and 3 and end of study (typically Month 6) to gain a deeper understanding of the feasibility of implementing the AMAZE™ platform. In addition to the qualitative interviews, all participants were asked to complete various surveys throughout the study to assess the usability and acceptability of the AMAZE™ platform.

Patients completed the following forms and surveys:

- AMAZE™ Patient App, including a daily log of asthma symptoms, and additional questions on their asthma experience
- Asthma Control Test (ACT) also referred to as Care Team Request in App
- Patient Demographic Questionnaire
- Patient User Experience Survey
- Patient Visit Experience Survey
- System Usability Scale (SUS)
- Patient Satisfaction Questionnaire-18 (PSQ-18)

Clinical sites completed the following forms and surveys

- Clinical Case Report Form (CRF)
- Chart Review CRF
- System Usability Scale (SUS)
- Post-study Survey

5. TARGET POPULATION AND SAMPLE SIZE

Clinic staff invited patients ≥18 years old with an asthma diagnosis who were presenting for a clinic visit or via telephone to download the AMAZE™ App. STUDY SITE 1 aimed to recruit approximately 120 patients, and STUDY SITE 2 aimed to recruit approximately 50 patients.

5.1 Inclusion Criteria

Patients must have met all the following criteria to be considered for enrollment:

- ≥18 years old at the time of enrollment
- Clinically confirmed diagnosis of asthma
- Access to a smartphone with internet access, with the following requirements: iPhone (Operating System iOS 13 or newer, and Devices iPhone 8 or newer) or Android (Operating System 8.0 or newer)
- Able to understand and speak English sufficiently to use the AMAZE™ patient App
- Willingness to participate in a telephone interview and be audio-recorded
- Consenting to participate in the study

5.2 Exclusion Criteria

Patients who met any of the following criteria were not included in the study:

- Current diagnosis of active COPD (STUDY SITE 1 only)
- Current diagnosis of any pulmonary diagnosis other than asthma
- Has a cognitive impairment, hearing difficulty, acute psychopathology, medical condition, or insufficient knowledge of the English language that—in the opinion of the investigator—would interfere with their ability to agree to participate and/or complete the ACT™

6. PRIMARY OBJECTIVE STATISTICAL METHODS

All analyses were conducted following the approved SAP. The analyses detailed therein were conducted on a clean dataset. All analyses were conducted separately, by site and overall.

Quantitative analyses were performed using SAS version 9.4, and qualitative analyses were performed using a detailed interviewer note tracker.

- Descriptive statistics were defined as follows:
    - Categorical variables: frequencies, percentages of each category with the number of patients with missing category data
    - Continuous variables: frequencies, mean, standard deviation (SD), median, range (minimum [min] to maximum [max])

- Participant-level analyses were calculated from the baseline date of enrollment, while clinician-level analyses were analyzed from the date the first patient was enrolled.

- No data imputations occurred in this analysis. All missing data were tabulated and reported in the analysis tables.

- Weak, moderate, and strong Spearman correlations were defined as <0.30, 0.30 to 0.60, and >0.60 respectively.

For primary objectives, the frequency of use of the AMAZE™ App by participants, and the AMAZE™ dashboard by clinical site staff, during the study were described using data collected within the App platform.

Qualitative follow-up interviews were summarized and tabulated, reporting frequency counts and percentages by month (based on interviewers' notes) to understand the long-term feasibility of the patient App and to understand the long-term feasibility of AMAZE™ in a clinical setting, including barriers, benefits, challenges, ease of implementation, and areas for improvement of the AMAZE™ platform from the participant and the clinical site staff's perspective.

7. EXPLORATORY OBJECTIVE STATISTICAL METHODS

To address the first exploratory objective on assessing the impact of AMAZE™ on clinical outcomes, descriptive statistics were used to summarize the baseline clinical CRF, end of study chart review CRF, AMAZE™ daily log, trends in clinical outcomes associated with clinical visit(s) and flags generated by the clinician dashboard.

To address the second exploratory objective on identifying participant segments most likely to benefit from using AMAZE™, participant responses to item 9 of the visit survey were assessed by engagement on the AMAZE™ platform, as well as by patient subgroups/segments.

8. STUDY DISPOSITION AND PARTICIPANT CHARACTERISTICS

The total analytic sample was 153 participants**.** A total of 8 clinical staff participated**.**

Of the 153 eligible baseline participants, 120 completed the baseline sociodemographic form due to 33 participants not responding**.** Mean age was 38.7 (SD=16). Most participants were female (76.7%), White (77.5%) or Black or African American (9.2%), employed full-time (40.8%), and had a college/university degree or higher (60.9%). Overall, the mean age at diagnosis was 20.6, and more than three-quarters (79.2%) never smoked. The most commonly reported comorbid health conditions were allergies (23.3%), allergic rhinitis (17.5%), and

anxiety (14.2%). Clinical staff completed a clinical CRF for all eligible baseline participants. The mean age at diagnosis was 40.3. Overall, the mean time the participants had seen a HCP for asthma was 17.8 years.

Overall, most patients had clinician-reported moderate persistent (62.7%) or severe persistent (20.3%) asthma severity, but most (77.1%) were well controlled. Almost all participants (90.2%) were taking short-acting beta agonists (SABAs) alone. Clinic staff were also asked to report exacerbation history since enrollment in the study. Overall, eight participants required courses of OCS for asthma symptom worsening, seven participants required ER or urgent care visits, five required unplanned ambulatory clinical visits due to exacerbations, and one required a hospital stay of at least 24 hours.

9. PRIMARY RESULTS

9.1 Usage Metrics

Most participants (n=147/153, 96.1%) accessed the home page, and most (n=146/153, 95.4%) accessed the daily asthma log at least once during Weeks 1 to 4. Usage decreased throughout Weeks 9 to 12. By Weeks 21 to 24, of the N=93 eligible at final follow-up, only 51.6% of participants (n=48/93) accessed the home page at least once, and 47.3% (n=44/93) accessed the daily log at least once; other features were accessed by ≤11% of participants. The appointments, air quality, and educational materials were accessed the least throughout the study period.

9.2 Impact of AMAZE™ on Patient Visits

All participants (n=121) who had a clinic visit were invited to complete the patient visit experience survey following their visit. A total of 43 visit surveys were completed by 35 participants, with each participant completing a mean of 1.2 visit surveys. Participants responded “neutral” most frequently to a majority of the items, followed by “agree” and “strongly agree.”

9.3 Feasibility and Usability of AMAZE™

Participants were asked to evaluate their user experience across Months 1, 3, and end of study via the user experience survey. Across sites at Month 1, most participants were “satisfied” (22.5%) or “very satisfied” (61.8%) with their asthma care.

Overall, 72.5% of participants were “satisfied” or “very satisfied” with the App, and 71.6% would be likely or very likely to recommend the App to other participants. When asked about any concerns with the App, a small proportion of participants forgot to use the App (36.3%) and felt things were missing from it (24.5%).

At Month 3, a larger percent of participants (51.6%) reported forgetting to use the App, with a similar proportion at end of study (50.6%). At end of study, 33.8% of participants agreed with

the statement: “Since the start of the study, use of the AMAZE™ app helped me avoid ER or Urgent Care center visit(s) or hospitalization(s).”

9.4 Feasibility and Usability of AMAZE™ in Clinical Settings

Clinicians (n=7) were asked to complete a post-study survey at end of study. Overall, the clinicians reported that implementing the AMAZE™ platform into their practice was very easy and helped manage patients. HCPs indicated that the features found most useful included the ability to track symptoms (42.9%), triggers (28.6%), and integration with ER records (42.9%). The feature HCPs found not useful was the patient-HCP messaging feature (28.6%). Finally, the clinicians indicated that AMAZE™ improved patient engagement with their treatment, risk or control, and improved patient adherence with their treatment.

9.5 Evaluating Patient Satisfaction with Healthcare Experience

As a part of this study, participants completed the PSQ-18 at end of study. Overall, participants had high satisfaction with their healthcare experience. The mean PSQ-18 domain scores ranged from 3.8 (“Accessibility and Convenience”) to 4.3 (“Interpersonal Manner”); higher domain scores indicated greater satisfaction.

9.6 Qualitative Longitudinal Interviews

Participants were randomly selected to take part in qualitative, semi-structured, telephone interviews conducted at approximately one, three, and six months after study enrollment. The interview was conducted using a semi-structured interview guide covering topics such as overall impressions of the App, feedback on App features, long-term use of App, and recommendations for future asthma patients.

9.6.1 Month 1 Qualitative Interviews

Twenty-two participants completed a qualitative interview for Month 1. Almost all participants (n=21, 95.5%) had a positive view of the App and thought it was easy to use, using terms such as “straightforward,” “intuitive,” “easy to use,” and “user friendly.” The Daily Log (including daily asthma question, symptoms, and triggers) was the most frequently used App feature, with all participants (100%) reportedly using it. A majority of participants (n=15, 68.2%) felt the log was helpful to complete. When asked, nearly all participants (n=20, 90.9%) would consider using the App as part of their long-term asthma care.

9.6.2 Month 3 Qualitative Interviews

Of the twenty-two participants who completed the Month 1 interviews, 15 participants completed a qualitative interview for Month 3. All participants (100.0%) had a positive view of the App and thought it was easy to use, describing it as “straightforward,” “quick and easy to complete,” “helpful,” and having a “pleasant interface.” Over two-thirds of subjects would consider using the App as part of their long-term asthma care. Overall, less than one-third of

participants hoped to gain better insight into their asthma symptoms, a better plan of care, monitor trends over time, or document how their asthma is doing.

9.6.3 End of Study Qualitative Interviews

Fourteen of the initial 22 participants completed a qualitative interview at End of Study. All participants (100.0%) had an overall positive view of the App, and thought it was "straightforward," "intuitive," "easy to use," "good," and indicated it had a "pleasant interface." All participants (100.0%) reported using the Daily Log, with eleven participants (78.6%) finding the feature useful and two (14.3%) mentioned it wasn't useful due to their asthma being under control. Nearly all participants (n=11, 78.6%) would consider using the App as part of their long-term asthma care, because their HCP can see what is going on with their asthma (28.6%), and it is helpful to look at asthma symptoms, triggers, and air quality (28.6%). Almost all participants (n=12, 92.9%) would recommend the App to others because it helps with better communication with their HCP and monitoring their asthma.

9.6.4 Qualitative Interviews with STUDY SITE 1

One clinician and one medical assistant participated in longitudinal interviews for STUDY SITE 1 at Months 1, 3, and end of study. The interviews asked about the App onboarding and monitoring process, feedback on continued use of the system, and any benefits to clinical outcomes or patient interactions. When describing the onboarding process, STUDY SITE 1 staff mentioned that they would walk older patients through the App but did not always walk younger patients through all the features due to their familiarity with Apps. They estimated it took an additional 5 to 30 minutes to onboard patients to the App during a patient visit.

When describing their monitoring process of the clinician dashboard, the STUDY SITE 1 physician confirmed they would try to review flags daily and contact patients as needed based on findings. The physician felt certain flags (i.e., ACT score below 20) would cause staff to reach out and possibly prescribe prednisone depending on severity. For follow-up visits, the STUDY SITE 1 staff mentioned they would review the dashboard prior to the appointment to see if the patient had any relevant flags and review the history of their Daily Log reports. The STUDY SITE 1 physician reported by end of study that approximately one-third of patients had moved an appointment up based on HCP review of AMAZE™ results, including peak flow, symptom reports, and medication use. Overall, the STUDY SITE 1 physician felt the AMAZE™ platform was "filling a niche need" and that COVID highlighted the need for patient connectivity via electronic platforms.

9.6.5 Qualitative Interviews with STUDY SITE 2

Four clinicians and two nurses participated in longitudinal interviews. At STUDY SITE 2, the nurses were responsible for reviewing the dashboard twice a day, every day, and engaging with patients with flags (via phone or the AMAZE™ messaging feature) to then encourage

them to contact their physician about any changes in their asthma experience. Clinicians and nurses described concerns with workflow and additional time monitoring the dashboard. Concerns with flags were also raised by clinicians and nurses, including improving the prioritization of flags and differentiating flags from a patient's baseline or daily experience. Two clinicians and one nurse stated they thought a benefit of the AMAZE™ platform was during follow-up visits where staff could see the trends in their patients and evaluate medication use. Finally, the clinician who withdrew from the study early explained that they were concerned that the communication feature of the App may cause a delay in patient care, provide a false sense of security when something was wrong, and generated duplicate communication channels with STUDY SITE 2's other patient portal system that had a messaging feature included.

10. EXPLORATORY RESULTS

10.1 Evaluating Asthma Control

On average, participants had 76.9 days (SD=37.28) between ACT™ completions (baseline to last completion). Of the participants with baseline and last completion ACTs, the mean total change score was 0.2 (SD=3.4), showing that (on average) participants had stable asthma control during the study.

10.2 AMAZE™ Daily Log

For the total sample, daily log entries were consistent across each four-week period, with a majority of entries (at least 69%) being "good." When assessing asthma symptoms that were reported along with daily log entries, for the total sample, "bad" daily log entries mostly corresponded with chest congestion (28.4%); the remaining symptom reports vary by daily log entry, with no clear pattern.

Triggers were also assessed by daily log entry, with no clear pattern of reporting triggers by log entry response. Overall, the most commonly reported trigger was pollen (10.0%).

When evaluating medication use and healthcare utilization by daily log entries for the overall sample, a majority of entries associated with quick relief/as-needed medication use were "bad" (76.0%) compared to "okay" or "good."

10.3 Trends in Clinical Outcomes Due to Clinical Visits

Asthma status rating per the daily log was assessed 2 weeks prior to a clinical visit. Overall, there were 28 unique visits reported within two weeks prior to a daily log entry; almost all of those entries were "okay" (43.6%) or "good" (50.6%)

Asthma symptoms reported within 2 weeks prior to a visit were assessed. For the total sample, the most commonly reported symptoms within two weeks prior to a visit were runny nose (22.4%) and coughing (19.8%).

10.4 Patient Engagement Using Survival Estimates by Baseline ACT

There was a non-significant trend towards participants with well-controlled asthma engaging with the App for a shorter duration compared to patients who were not well-controlled and very poorly controlled.

10.5 Patient Engagement by Key Characteristics

Baseline ACT score (very poorly and not-well controlled vs. well-controlled) and GINA classification (class 1,2 vs. class 3,4,5) showed a non-significant trend with more severe patients (very poorly not-well controlled and GINA 3,4,5) being high or medium engagers with the App. Gender, age, asthma severity, race, and education were non-significant with no clear trends.

11. CONCLUSION(S)

Most participants were satisfied with the AMAZE™ App and engagement showed a trend towards being higher for those with poorly controlled asthma; however, overall usage decreased over time. Improvements to the App and future studies evaluating optimal level of engagement, timing of completion of features, and engaging well-controlled asthmatic patients may be needed. Lastly, introducing strategies for integration in to already established clinical practice patient portals and generating gamification components within the App may further expand engagement within asthma patients.