

Supplementary Online Content

Lim MC, Boland MV, McCannel CA, et al. Adoption of electronic health records and perceptions of financial and clinical outcomes among ophthalmologists in the United States. *JAMA Ophthalmol*. Published online December 28, 2017. doi:10.1001/jamaophthalmol.2017.5978

eMethods. Electronic Health Record (EHR) Survey 2016

eTable. The Top Electronic Health Record (EHR) and Image Management Systems Used by Respondents in This Survey by Frequency.

eFigure. Computerization of Clinical Information Systems in the 2011 Ophthalmology EHR Survey (Left) and in the 2016 Survey (Right).

This supplementary material has been provided by the authors to give readers additional information about their work.

eMethods - Electronic Health Record (EHR) Survey 2016

Survey of AAO membership regarding current status and future plans with regard to Electronic Health Records

You have been chosen from a select sample of Academy members to complete a short survey on electronic health record systems and federal meaningful use regulations.

The survey should take you no more than 10 to 15 minutes to complete and should be completed by a practicing physician. If you start the survey and then find that you need additional information or that you need additional information to complete part of it, you may save your progress by clicking on the "Resume Later" button at the bottom of each screen.

The deadline for completion is **September 30**.

Your response will help the Academy more effectively communicate and advocate with CMS and Congress on your behalf (note that only aggregate results will be shared). All responses are confidential.

If you have questions, contact Flora Lum, MD, at 415.561.8592 or at flum@ao.org.

There are 37 questions in this survey

Practice Demographics

Please answer all of the following questions for your **entire practice** (not just for a subset of providers or yourself). If you are part of a larger health system, please answer based on your particular location and any satellite locations that you or your colleagues use to provide care. If necessary, **please estimate** when asked to assign numbers to aspects of your practice (numbers of people, dates, etc.)

[] Please select the item that best describes your practice setting. For the purpose of this survey, your practice includes those providers with whom you share a common medical record system. *

Please choose **only one** of the following:

- Ophthalmology Only
- Ophthalmology with other medical specialties
- Other

[] Which subspecialties of ophthalmology are represented in your practice (check all that apply)? *

Please choose **all** that apply:

- Comprehensive
- Cornea and External Disease
- Cataract
- Glaucoma
- Neuro-Ophthalmology
- Oculoplastics
- Ophthalmic Pathology
- Ophthalmic Oncology
- Pediatrics
- Refractive Surgery
- Medical Retina
- Surgical Retina
- Strabismus

Uveitis/Ocular Immunology

Other:

[]How many ophthalmologists are in your practice? *

Only numbers may be entered in this field.

Please write your answer here:

Enter a number for the number of full time equivalent ophthalmologists in your practice (can include a decimal value).

[]What item best describes the majority owner of your practice? If your practice is part of a larger health system that shares the same medical record (VA, Kaiser, University), please enter the name in the comment box. *

Please choose **only one** of the following:

- Government
- Hospital or Integrated delivery system
- Insurance company or HMO
- Management services organization or physician practice management company
- Physician-owned
- University or medical school
- Other component of an academic medical institution

Make a comment on your choice here:

[]What are your plans with regard to Electronic Health Records in your practice? *

Please choose **only one** of the following:

- The EHR is fully implemented for all physicians
- The EHR is implemented for some physicians (and we are NOT in the process of further implementation)
- We are in the process of implementing the EHR
- Implementation is planned within 24 months
- Implementation is NOT planned within the next 24 months

Physician Characteristics

The remaining questions apply to you as the physician responding to the survey and not to your practice in general.

[] For how many years have you been practicing ophthalmology? *

Only numbers may be entered in this field.

Please write your answer here:

[] Have you used paper medical records, either during training or in practice? *

Please choose **only one** of the following:

- Yes
 No

[] Are you personally using an electronic health record in your practice? *

Please choose **only one** of the following:

- Yes
 No

[] Were you personally practicing when your practice transitioned from paper records to your current EHR? *

Only answer this question if the following conditions are met:

Answer was 'Yes' at question '8 [physehr]' (Are you personally using an electronic health record in your practice?)

Please choose **only one** of the following:

- Yes
 No

[] How many years have you personally been using electronic health records in your practice? Include time spent using any EHR, not just the current one. *

Only answer this question if the following conditions are met:

Answer was 'Yes' at question '8 [physehr]' (Are you personally using an electronic health record in your practice?)

Only numbers may be entered in this field.

Please write your answer here:

IT Adoption

[] Indicate the degree to which the following office functions are electronic or paper-based in your practice. *

Please choose the appropriate response for each item:

	Completely paper-based	Mostly paper-based but partially computer-based	About equal parts paper- and computer-based	Mostly computer-based but partially paper-based	Completely computer-based
Practice management (registration/scheduling)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Clinical documentation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Image management (photography, imaging devices, testing, etc)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Medication prescribing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Billing (charge capture, claim submission)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

[] Where do your EHR data reside? *

Only answer this question if the following conditions are met:

Answer was NOT 'Completely paper-based' at question '11 [itadoption]' (Indicate the degree to which the following office functions are electronic or paper-based in your practice. (Clinical documentation))

Please choose **only one** of the following:

- On a server located at or near your office and managed by staff controlled by your organization
- On a server located outside your organization and managed by your EHR vendor (Software As A Service - SAAS, Application Service Provider - ASP, or "cloud" based)
- I don't know
- Other

Make a comment on your choice here:

[] How are data entered into your electronic health record? *

Only answer this question if the following conditions are met:

Answer was NOT 'Completely paper-based' at question '11 [itadoption]' (Indicate the degree to which the following office functions are electronic or paper-based in your practice. (Clinical documentation))

Please choose **all** that apply:

- Notes are recorded on paper and scanned into an electronic system
- Some portions of the exam and history are recorded on paper and some are entered into the computer (typing, clicking)

- Notes are entered by a PHYSICIAN directly into the computer (typing, clicking)
- Notes are entered by a SCRIBE directly into the computer (typing, clicking)
- Notes are dictated and transcribed by a human
- Notes are dictated and then transcribed using voice recognition software (e.g. Dragon)

Other:

[]What is the name of the vendor who made your clinical documentation (electronic health record) system? *

Only answer this question if the following conditions are met:

Answer was NOT 'Completely paper-based' at question '11 [itadoption]' (Indicate the degree to which the following office functions are electronic or paper-based in your practice. (Clinical documentation))

Please choose **only one** of the following:

- Unknown
- Allscripts Touchworks EHR (Allscripts)
- Compulink (Compulink Business Systems, Inc.)
- Doctorsoft (Doctorsoft Corp.)
- Epic (Epic Systems Corp.)
- Eyedoc EMR (Penn Medical Informatics Systems Inc.)
- Eyefinity (Eyefinity, Inc.)
- EyeMD EMR (EyeMD EMR Healthcare Systems, Inc.)
- iDOC (iMedicWare)
- ifa Ophthalmology Software (ifa systems AG)
- Integrity EMR For Eyes (Integrity Digital Solutions, LLC)
- io Practice Ware (io Practice Ware)
- Key Chart (KeyMedical, Software, Inc.)
- Maxim Eyes EHR (First Insight Corp.)
- MDIntellesys (NextTech Systems)
- MDOffice (MDOffice, Inc.)
- Medflow EHR (Medflow, Inc.)
- EMA Ophthalmology (Modernizing Medicine, Inc.)
- MyVision Express (Insight Software, LLC)
- NexTech (NexTech Systems, LLC)
- NextGen Ambulatory EHR (NextGen Healthcare Information Systems, LLC)
- SRSoft (SRSoft)
- VersaSuite (Universal Software Solutions, Inc.)
- Other

[]What is the name of the vendor who made your image management/photography system? *

Only answer this question if the following conditions are met:

Answer was NOT 'Completely paper-based' at question '11 [itadoption]' (Indicate the degree to which the following office functions are electronic or paper-based in your practice. (Image management (photography, imaging devices, testing, etc)))

Please choose **only one** of the following:

- Unknown
- Axis Image Management System (Escalon Medical Corp.)
- EyeRoute,Synergy (Topcon Corp.)
- FORUM (Carl Zeiss Meditec)
- imageSPECTRUM (Canon USA, Inc.)
- INFINITT Ophthalmology (INFINITT Healthcare Co., Inc.)
- iViews Imaging System (iViews Imaging System, LLC.)
- Medflow Imaging (Medflow, Inc.)
- Merge Eye Care PACS (Merge Healthcare, Inc.)
- PACSPLUS (PACSPLUS)
- VersaSuite PACS (Versasuite, Universal Software Solutions, Inc.)
- Visbion (Visbion, Ltd.)
- Other:

[]

How do you view your images and results from testing devices (e.g. OCT, fundus camera, automated perimetry, electroretinography, etc.)? Please select ALL options that apply to your practice. *

Please choose **all** that apply:

- I review images and reports on paper
- I review images and reports using the vendor's proprietary software
- I review images and reports that have been scanned into a computer-based system
- I review images and reports that have been transferred into a third party image management system (PACS)
- I review images, reports, and/or data from devices in my electronic health record (not a separate system)
- I am not sure how images and reports are handled
- Other:

EHR Impact

The following questions ask you to provide your impression of the impact of your EHR on your personal practice.

[]What is your overall degree of satisfaction with your clinical documentation system? *

Only answer this question if the following conditions are met:

Answer was 'Yes' at question '8 [physehr]' (Are you personally using an electronic health record in your practice?)

Please choose **only one** of the following:

- Extremely Satisfied
- Satisfied
- Neutral
- Unatisfied
- Extremely Unsatisfied

Make a comment on your choice here:

[]Would you go back to using paper records if given the chance? *

Only answer this question if the following conditions are met:

Answer was 'Yes' at question '8 [physehr]' (Are you personally using an electronic health record in your practice?) *and* Answer was 'Yes' at question '9 [ehrtrans]' (Were you personally practicing when your practice transitioned from paper records to your current EHR?)

Please choose **only one** of the following:

- Yes
- No
- I don't know or am not sure

Make a comment on your choice here:

[]Which of the following best describes your experience with paper versus electronic records

in terms of the time required to complete all aspects of patient care including: reviewing the existing record, documenting the history, documenting the eye exam, documenting your impression and plan, refilling prescriptions, returning telephone calls, sending letters to referring doctors, charge capture, etc.? *

Only answer this question if the following conditions are met:

Answer was 'Yes' at question '9 [ehrtrans]' (Were you personally practicing when your practice transitioned from paper records to your current EHR?)

Please choose **only one** of the following:

- Paper medical records required less time
- Electronic medical records require less time
- Paper and electronic records require about the same amount of time
- I don't know or I am not sure about the time required

Make a comment on your choice here:

[]After allowing six months after implementation for physicians and staff to become familiar with the EHR, what is your perception of what happened to physician productivity in terms of number of patients seen per day compared to when using paper records? *

Only answer this question if the following conditions are met:

Answer was 'Yes' at question '9 [ehrtrans]' (Were you personally practicing when your practice transitioned from paper records to your current EHR?)

Please choose **only one** of the following:

- Productivity increased
- Productivity remained the same
- Productivity decreased
- I don't know or am not sure what happened to productivity

Make a comment on your choice here:

[]After allowing six months after implementation for physicians and staff to become familiar with the EHR, what is your perception of happened to overall practice costs (staff, EHR, transcription, etc.)? *

Only answer this question if the following conditions are met:

Answer was 'Yes' at question '9 [ehrtrans]' (Were you personally practicing when your practice transitioned from paper records to your current EHR?)

Please choose **only one** of the following:

- Costs increased
- Costs remained the same
- Costs decreased
- I don't know or I am not sure what happened to costs

Make a comment on your choice here:

[]After allowing six months after implementation for physicians and staff to become familiar with the EHR, what is your perception of what happened to the net revenue of your practice? *

Only answer this question if the following conditions are met:

Answer was 'Yes' at question '9 [ehrtrans]' (Were you personally practicing when your practice transitioned from paper records to your current EHR?)

Please choose **only one** of the following:

- Net revenue increased
- Net revenue remained the same
- Net revenue decreased
- I don't know or I am not sure what happened to net revenue

Make a comment on your choice here:

[]After allowing six months after implementation for physicians and staff to become familiar with the EHR, what is your perception of what happened to your coding of office visits (E&M and eye codes)? *

Only answer this question if the following conditions are met:

Answer was 'Yes' at question '9 [ehrtrans]' (Were you personally practicing when your practice transitioned from paper records to your current EHR?)

Please choose **only one** of the following:

- I am coding at a higher level using EHR compared to paper
- I am coding at the same level using EHR compared to paper
- I am coding at a lower level usign EHR compared to paper
- I don't know or I am not sure what happened to my coding
- Coding is not relevant in my practice

Make a comment on your choice here:

[]After allowing six months after implementation for physicians and staff to become familiar with the EHR, what is your perception of what happened to your rate of charge capture (proportion of charges captured for visits, procedures, tests)? *

Only answer this question if the following conditions are met:

Answer was 'Yes' at question '9 [ehrtrans]' (Were you personally practicing when your practice transitioned from paper records to your current EHR?)

Please choose **only one** of the following:

- My rate of charge capture is higher with the EHR that it was with paper
- My rate of charge capture is the same with the EHR as it was with paper
- My rate of charge capture is lower with the EHR than it was with paper
- I don't know or I am not sure what happened to my rate of charge capture
- Charge capture is not relevant to my practice

Make a comment on your choice here:

[] Would you recommend your EHR system to other ophthalmologists? *

Only answer this question if the following conditions are met:

Answer was 'Yes' at question '8 [physehr]' (Are you personally using an electronic health record in your practice?)

Please choose **only one** of the following:

- Yes
 No

[] In your opinion, what is your patients' attitude toward the use of an electronic health record in your practice? *

Only answer this question if the following conditions are met:

Answer was 'Yes' at question '8 [physehr]' (Are you personally using an electronic health record in your practice?)

Please choose **only one** of the following:

- Patient attitudes are positive
 Patient attitudes are neutral
 Patient attitudes are negative
 I don't know or am not sure about patient attitudes

Make a comment on your choice here:

[] Which of the following best describes your overall experience providing care in your practice using paper records compared to electronic records? *

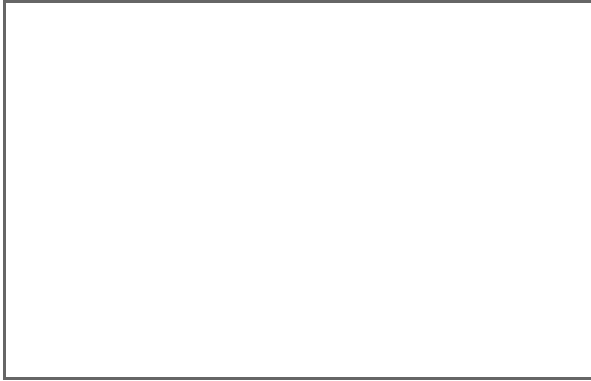
Only answer this question if the following conditions are met:

Answer was 'Yes' at question '9 [ehrtrans]' (Were you personally practicing when your practice transitioned from paper records to your current EHR?)

Please choose **only one** of the following:

- My experience with electronic records is better than my experience with paper records
 My experience is about the same with electronic records compared to paper records
 My experience with electronic records is worse than my experience with paper records
 I don't know or am not sure about the difference in my experience

Make a comment on your choice here:



[]Which of the following best describes your opinion regarding the quality of care you deliver with electronic records compared to paper records? *

Only answer this question if the following conditions are met:

Answer was 'Yes' at question '9 [ehrtrans]' (Were you personally practicing when your practice transitioned from paper records to your current EHR?)

Please choose **only one** of the following:

- Electronic records make it easier to provide quality care compared to paper records
- Electronic records have no impact on my ability to provide quality care compared to paper records
- Electronic records make it more difficult to provide quality care compared to paper records
- I don't know or am not sure about how electronic records impact the quality of care I provide

Make a comment on your choice here:



[]What is your overall degree of satisfaction with your image management/photography system? *

Only answer this question if the following conditions are met:

Answer was NOT 'Completely paper-based' at question '11 [itadoption]' (Indicate the degree to which the following office functions are electronic or paper-based in your practice. (Image management (photography, imaging devices, testing, etc)))

Please choose **only one** of the following:

- Extremely Satisfied
- Satisfied
- Neutral
- Unsatisfied
- Extremely Unsatisfied

Documentation

The following questions apply to the documentation produced by your electronic health record.

[] Does your electronic health record allow you to copy forward previous eye exam documentation or progress notes? *

Only answer this question if the following conditions are met:

Answer was 'Yes' at question '8 [physehr]' (Are you personally using an electronic health record in your practice?)

Please choose **only one** of the following:

- Yes
- No
- I don't know or am not sure

[] In your experience, how often do EHR documentation errors (e.g. outdated information copied forward, contradictory statements, authorship confusion, data entered for wrong patient, etc.) occur? *

Only answer this question if the following conditions are met:

Answer was 'Yes' at question '8 [physehr]' (Are you personally using an electronic health record in your practice?)

Please choose **only one** of the following:

- Never
- Rarely
- Sometimes
- Frequently
- I don't know or am not sure about the frequency of documentation errors

[] Does your practice or institution have guidelines or policies governing the integrity of documentation in electronic health records? *

Only answer this question if the following conditions are met:

Answer was 'Yes' at question '8 [physehr]' (Are you personally using an electronic health record in your practice?)

Please choose **only one** of the following:

- Yes
- No
- I don't know or am not sure

Meaningful Use

[]Which of the following best describes your level of knowledge with regard to EHR incentive payments from Medicare or Medicaid ("meaningful use") *

Please choose **only one** of the following:

- I have enough knowledge of the program to make a decision about participating
- I have some knowledge of the program
- I have little or no knowledge of the program

Make a comment on your choice here:

[]Which of the following best describes your status with regard to Stage 1 of the Medicare and Medicaid EHR incentive program ("Meaningful Use")? *

Please choose **only one** of the following:

- I have already attested to Stage 1
- I am planning to attest to Stage 1
- I am not planning to attest to Stage 1
- I am not sure if I attested to Stage 1

Make a comment on your choice here:

[]Which of the following reasons best explain why you did not attest to Stage 1 of the Medicare and Medicaid EHR Incentive Program ("meaningful use")? Please use the "Other" option to provide comments or additional reasons. *

Only answer this question if the following conditions are met:

Answer was 'I am not planning to attest to Stage 1' at question '34 [mustage1]' (Which of the following best describes your status with regard to Stage 1 of the Medicare and Medicaid EHR incentive program ("Meaningful Use")?)

Please choose **all** that apply:

- My EHR is not or was not certified for Stage 1
- The "meaningful use" program is not relevant to my practice
- The cost of participating is too high
- The complexity of participating is too high
- Other:

[] Which of the following best describes your plans with regard to subsequent stages of the Medicare and Medicaid EHR Incentive Program ("meaningful use")? *

Only answer this question if the following conditions are met:

Answer was 'I have already attested to Stage 1' at question '34 [mustage1]' (Which of the following best describes your status with regard to Stage 1 of the Medicare and Medicaid EHR incentive program ("Meaningful Use")?)

Please choose **only one** of the following:

- I have already attested to Stage 2
- I am planning to attest to Stage 2
- I am not planning to attest to Stage 2
- I am not sure if I attested to Stage 2
- Other:

[] Which of the following reasons best explain why you do not plan to attest to Stage 2 of the Medicare and Medicaid EHR Incentive Program ("meaningful use")? Please use the "Other" option to provide comments or additional reasons. *

Only answer this question if the following conditions are met:

Answer was 'I am not planning to attest to Stage 2' at question '36 [mus2att]' (Which of the following best describes your plans with regard to subsequent stages of the Medicare and Medicaid EHR Incentive Program ("meaningful use")?)

Please choose **all** that apply:

- My EHR is not certified for Stage 2
- The "meaningful use" program is not relevant to my practice
- The cost of participating is too high
- The complexity of participating is too high
- Other:

Thank you for your participation. Your input will help the AAO better understand the current and future role of EHRs for members.

Submit your survey.
Thank you for completing this survey.

eTable. The top electronic health record (EHR) and image management systems used by respondents in this survey by frequency.

Top 10 EHR Systems Used By Survey Respondents	Top 8 Image Management Systems Used By Survey Respondents
<ol style="list-style-type: none"> 1. EpicCare (Epic Systems Corp.) 2. NextGen (NextGen Healthcare Information Systems, LLC) 3. Medflow EHR (Medflow, Inc.) 4. MD Intellisys (NexTech Systems) 5. EyeMD EMR (EyeMD EMR Healthcare Systems, Inc.) 6. ioPractice Ware (io Practice Ware, Inc.) 7. Compulink (Compulink Business Systems, Inc.) 8. NexTech (NexTech Systems, LLC) 9. EMA Ophthalmology (Modernizing Medicine, Inc.) 10. Integrity EMR for Eyes (Integrity Digital Solutions, LLC). 	<ol style="list-style-type: none"> 1. FORUM (Carl Zeiss Meditec, Inc.) 2. Medflow Imaging (Medflow, Inc.) 3. Axis Image Management Systems (SonomedEscalon) 4. Eyeroute/Synergy (Topcon Corp.) 5. Merge Eye Care PACS (Merge Healthcare, Inc.) 6. iViews (iViews Imaging System, LLC.) 7. imageSPECTRUM (Canon USA, Inc.) 8. VersaSuite PACS (Versasuite, Universal Software Solutions, Inc.).

eFigure. Computerization of clinical information systems in the 2011¹ – ophthalmology EHR survey (left) and in the 2016 survey (right).

