Electronic Health Record Tools to Care for At-Risk Older Drivers: A Quality Improvement Project

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Abstract

Purpose of the Study. Evaluating driving safety of older adults is an important health topic, but primary care providers (PCP) face multiple barriers in addressing this issue. The study’s objectives were to develop an electronic health record (EHR)-based Driving Clinical Support Tool, train PCPs to perform driving assessments utilizing the tool, and systematize documentation of assessment and management of driving safety issues via the tool.

Design and Methods. The intervention included development of an evidence-based Driving Clinical Support Tool within the EHR, followed by training of internal medicine providers in the tool’s content and use. Pre- and postintervention provider surveys and chart review of driving-related patient visits were conducted. Surveys included self-report of preparedness and knowledge to evaluate at-risk older drivers and were analyzed using paired t-test. A chart review of driving-related office visits compared documentation pre- and postintervention including: completeness of appropriate focused history and exam, identification of deficits, patient education, and reporting to appropriate authorities when indicated.

Results. Data from 86 providers were analyzed. Pre- and postintervention surveys showed significantly increased self-assessed preparedness (p < .001) and increased driving-related knowledge (p < .001). Postintervention charts showed improved documentation of correct cognitive testing, more referrals/consults, increased patient education about community resources, and appropriate regulatory reporting when deficits were identified.

Implications. Focused training and an EHR-based clinical support tool improved provider self-reported preparedness and knowledge of how to evaluate at-risk older drivers. The tool improved documentation of driving-related issues and led to improved access to interdisciplinary care coordination.

Key words: Driving, Driver assessment, Electronic health record, Geriatric training
Few older adults expect to stop driving, although retirement from driving is the “norm”; on average men and women stop driving 6 and 10 years prior to death, respectively (Carr, Schwatzberg, Manning, & Sempek, 2010). This paradigm of driving until one dies originates from driving being considered a right; the social significance of driving as it relates to autonomy and independence; as well as the pragmatics of transportation (Stephens et al., 2005). Older drivers now drive later in life and they drive further than previous generations, representing a 27% increase in the number of drivers aged 65 from 1997 to 2011 (Centers for Disease Control and Prevention [CDC], 2013; Carr et al., 2010; Insurance Institute for Highway Safety [IIHS] and Highway Loss Data Institute [HLDI], 2014).

Although the incidence of fatal crashes is decreasing in this population and some older drivers do self-limit their driving, age-related physiological changes can negatively impact driving ability and are contributing factors in crashes involving older drivers (CDC, 2013; Insurance Institute for Highway Safety [IIHS] and Highway Loss Data Institute [HLDI], 2014). Driving-related mortality is the leading cause of accident-related death in people aged 65–74 and second only to falls for people 75 and older (Carr et al., 2010), underscoring the need for primary care providers (PCPs) to skillfully identify at-risk drivers and promote healthy driving behaviors. Providers cite barriers to discussing driving issues with patients, including time constraints; the potential to negatively impact the relationship with patients; a lack of knowledge about how to assess fitness to drive; and uncertainty about how to intervene if necessary (Adler and Rottunda, 2011; Betz et al., 2014; Carr et al., 2010; Jang et al., 2007; Miller and Morley, 1993).

Electronic health records (EHRs) are increasingly leveraged to support clinical practice by delivering tools within the EHR to support healthcare decision-making. This effort has been promoted nationally by the Institute of Medicine’s [IOM] (2001) report, “Crossing the Quality Chasm: A New Health System for the 21st Century” (Englebardt & Nelson, 2002; Institute of Medicine’s [IOM], 2001). No description of driving-related clinical support tools exists in the current literature. However, literature on EHR use generally supports topic-specific tool development; studies show summarized material to be more effective than mere access to database searches (Hersh, Crabtree, Hickam, Sacherek, Rose, & Friedman, 2000; Hersh et al., 2002; McKibbon & Fridsma, 2006; Wallace, Bigelow, Xu, & Elstein, 2007; Westbrook, Coiera, & Gosling, 2005). Provider preference in the literature supports design that minimizes interruptions, is opened on-demand, and is easily accessible during patient encounters (Ash, Sittig, Campbell, Guappone, & Dykstra, 2007; Ash et al., 2012; Epstein, Tannery, Wessel, Yarger, LaDue, & Fiorillo, 2010; McKibbon & Fridsma, 2006; Wallace et al., 2007). Voluntary use of tools prevents the unintended consequence of alert fatigue, which can lead to ignoring available resources (Ash et al., 2007).

This quality improvement project aimed to: (1) develop a Driving Clinical Support Tool in an EHR to assist PCPs in evaluating at-risk drivers based on a synthesis of current evidence and resources; (2) train PCPs to use the tool and its content; (3) via the training and use of the tool, increase provider knowledge and self-perceived preparedness to evaluate driving abilities in older adults and implement a plan of care; and (4) improve provider documentation of driving evaluation assessment and management within the EHR.

Methods
Design
This study was a brief intervention, a training, to enhance primary care internal medicine provider assessment, and management of at-risk older drivers using an EHR tool designed to guide clinical care. Pre- and postintervention surveys evaluated change in provider knowledge and preparedness to assess driving-related abilities in older adults and in developing appropriate plans for at risk older drivers. In addition, driving-focused office visit encounters were reviewed for compliance with good driving assessment practices before and after the intervention.

Sample
Participants were recruited from an academic primary care practice that included 25 faculty providers and 100 medical residents. All providers were invited to participate; 98 (78%) attended the training and completed the survey. The study was approved by the University Institutional Review Board and all included providers signed informed consent.

Procedure
EHR Driving Clinical Support Tool development
An EHR-based Driving Clinical Support Tool was developed to help PCPs evaluate at-risk drivers. Central to the EHR tool was the creation of a driving evaluation algorithm based on a literature review of evidence-based practice for evaluating at-risk drivers, as well as a visit note template focused on driving (see Figures 1 and 2). Guidelines of the American Medical Association (AMA) and the American Academy of Neurology (AAN) informed the algorithm and note (Carr, Schwartzberg, Manning, & Sempek, 2010; Iverson, Gronseth, Reger, Classen, Dubinsky, & Rizzo, 2010). Prior research has shown that executive function...
and speed of processing are important predictors of driving cessation that can sometimes be improved with training (Ackerman, Edwards, Ross, Ball, & Lunsman, 2008; Edwards, Delahunt, & Mahncke, 2009). The Trails B was recommended as part of the Driving Clinical Support Tool since it can quickly assess patient attention, psychomotor speed, and visual scanning in a busy primary care setting (Aksan, Anderson, Dawson, Uc, & Rizzo, 2015; Hetland, Carr, Wallendorf, & Barco, 2014; Iverson et al., 2010).

Content for the tool evolved through an iterative process including a literature review; a review of local licensing laws and definitions; an outline of the provider process for referring to the Department of Motor Vehicles (DMV) for a driving evaluation or for mandatory reporting of patients with severe and uncontrollable impairments; easy access to the definition of ‘severe and uncontrollable impairment’; an overview of the associated fees for driving evaluation by the DMV or private driving rehabilitation, which is not typically covered by insurance; and possible outcomes for patients after being reported as an at-risk driver (license revocation, opportunity for testing, reinstatement of license).

The tool also included a synthesis of local community resources available for vehicle modification, driver training, rehabilitation services, and alternative transportation resources. Patient and family educational materials to be used at office visits were developed to summarize the findings of an at-risk driving evaluation; offer an example of a family driving agreement; describe what it means to submit a mandatory referral; and provide a listing of the community resources described previously (rehabilitative evaluation, alternative transportation, mobility adaptation companies; see the Patient Instructions section of the Driving Order Set as shown in Figure 2). Considerations of usability and utility drove the design of the overall tool. Content and end-user experts reviewed the tool for accuracy, clarity, utility, and omissions. The development of a comprehensive compilation of driving-related provider and patient materials adapted for use in the EHR represented an interdisciplinary collaboration including PCPs, social service providers, and information technology specialists.

**Provider Training**

A 20-min training intervention was developed to train PCPs on the clinical evaluation of an at-risk driver and how
**Driving Order Set**

### Driving Evaluation

#### Reason for Visit

- Driver Evaluation
- Fitness to drive

#### Chart Note

- Driving Note (GERODRIVINGEVAL) [edit]

#### Orders

- CONSULT TO OPHTHALMOLOGY [CNSLT0006] (Internal referral)
- CONSULT TO OCCUPATIONAL THERAPY [REHAB00002] (Internal referral)
- CONSULT TO PHYSICAL THERAPY [REHAB00001] (Internal referral)
- CONSULT TO NEUROLOGY [CNSLT0042] (Internal referral)
- CONSULT TO NEUROPSYCHOLOGIST [CNSLT0189] (Internal referral)
- REHAB SPEECH LANGUAGE/COGNITIVE REFERRAL [REHAB00003] (Internal referral)

### Diagnosis

- Driving safety issue [V15.89]
- Parkinson’s disease [332.0]
- Mild cognitive impairment [331.83]
- Seizures [780.39]
- Osteoarthritis [715.90]
- Dementia [294.20]
- Vision problems [V41.0]

### Patient Instructions

#### Family Driving Agreement

- Normal Driving Evaluation
- At Risk Driving Evaluation
- Mandatory Referral (Oregon)
- Resources for Patients and Families
- Driving Rehabilitation Evaluations
- Alternative Transportation Resources
- Mobility Adaptation Companies

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**Figure 2.** Driving order set and provide note template. The symbols *** trigger the provider to enter data. The phrases surrounded by brackets ([ ]) are prompted lists (as shown) that the provider can select one or more appropriate clinical options.
Driving Evaluation Note/Provider Note Template

HPI:

Do you ever feel confused/disoriented while driving?: ***

Are you a daily or near-daily driver?: ***

Do you avoid driving alone?: ***

Do you have difficulty seeing the license plate of the car stopped ahead of you?: ***

Crashes/citations in last 12 months: ***

Family Concerns: ***

Exam:

Figure 2. Continued
Visual Acuity: 20/60 without corrective lenses (<20/70 passes)

Visual Field: grossly intact on confrontation, (at 3 feet) field cut

MSK: full active ROM in neck, ROM in finger curl, shoulder/elbow flexion, ankle dorsiflexion, and plantar flexion. Extremity strength ***/5 (score of 4/5 or higher passes). Able to perform Get-Up-And-Go (20 feet in 15 seconds), to rise with use of arms.

Neuro: Alert and oriented. Gait and speech normal. DTR ***, sensation intact.

Cognition: SLUMS score in last 6 months (SLUMS SCORE/NOT DONE:325062)

Figure 2. Continued
to use the Driving Clinical Support Tool within the EHR during an office visit. Provider trainings occurred during regularly scheduled team meetings for each of the practice’s five provider teams and via regularly scheduled ambulatory conferences for residents. A total of 9 trainings (given by 2 study investigators) were completed with 20 faculty and 78 residents. A survey was done prior to and immediately following each educational session to measure provider knowledge and preparedness to evaluate older adults for safe driving.

Measures
Demographic information was obtained from the participants and included clinical team, role (faculty or resident), and degree.
Assessment/Plan:

1. Driving status. Exam today shows the following:

   a. Vision: {DRIVING STATUS:325064}***

   b. Neuromuscular function: {NEUROMUSCULAR FUNCTION:325093}

      - no deficits identified
      - deficits identified: provided A/V/S regarding strengthening and stretching
      - refer to PT

   c. Cognitive function: {Cognitive Function:325065}***

2. Reviewed deficits with patient and recommend limited driving while pursuing rehabilitative services/further evaluation.

3. Reporting: {DRIVING - REPORTING:325066}

   - at this time no reporting indicated
   - OR DMV referral to driving evaluation completed
   - OR DOT referral to driving evaluation
   - OR DMV mandatory report completed and submitted (no mandatory reporting for WA)

4. Medications that may be contributing include ***, risks/benefits reviewed. Medications changed ***; medications stopped ***

5. Spent time today discussing with @FNAME@ and family expectations that @HE@ will not be able to drive indefinitely and recommend annual discussion of driving safety, which @HE@ is agreeable to.

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Provider Knowledge and Preparedness Survey

The Provider Knowledge and Preparedness Survey included an 11-item survey of 4 Likert scale and 7 multiple-choice questions developed specifically for this study (see Supplementary Appendix A for the survey). Questions assessed knowledge of important physical exam findings, state reporting requirements, medications that cause driving impairment, rehabilitation of driving-related deficits, and billing for the evaluation of driving-related deficits; clinical questions were taken from the AMA and the AAN driving-related guidelines (Carr et al, 2010; Iverson et al., 2010). Four questions addressed self-perceived skill in the ability to assess driving safety; plan driving-related interventions; access driving resources; and appropriately report unsafe driving to licensing bodies (Likert Scale 1–5, with a higher score indicating greater self-perceived skill). Five content experts, including a geriatrician, geriatric nurse practitioner, gerontologist-driving specialist, social worker, and nurse researcher reviewed the items for face validity.

Driving-Related Office Visits

Driving-related visits were evaluated based on documentation in the electronic health record. Driving-related encounters were included for analysis if they were coded using the ICD-9 code v58.19 (driving safety issue) or the EHR Driving Clinical Support Tool was utilized; the provider attended one of the driving training sessions and
completed the surveys; patient was age 65 or older; and the patient was seen between January 2011 (27 months prior to the intervention) through June 2014 (15 months after the intervention).

Investigators reviewed eligible charts to evaluate adoption of the Driving Clinical Support Tool, including use of evidence-based assessments and adequate documentation of appropriate plans when indicated. Key components of the chart review are outlined in Table 1 and include: driving evaluation and assessment (using best practice as outlined on the driving algorithm [see Figures 1 and 2]); adequacy of planning based on clinical findings (appropriate referrals, medication changes, instructions to stop driving if indicated); adherence to legal requirements (mandatory reporting for drivers with severe and uncontrolled deficits); and evidence of patient education, including use of appropriate community resources (Table 1).

Data Analysis

Analysis of the development of the EHR Driving Clinical Support Tool (research question #1) occurred iteratively through content expert review and refinement as described above. Analysis of the PCP training on the use of the Driving Clinical Support Tool (research question #2) was descriptive in terms of training attendance and attendee demographics. For research question #3, pre-and post-survey data were matched using a unique identifier allowing for paired comparison. Survey data were entered into Excel, using EZAnalyze software for analysis after 5% of data were verified and determined to be accurate. Survey items using a Likert scale were analyzed individually and as a composite score using paired t-tests. Multiple-choice questions were analyzed individually using Chi-squared tests and as a composite score using a paired t-test.

For research questions #4, clinical data from driving-related office visits were analyzed using quantitative descriptive techniques to code whether the Driving Clinical Support Tool could help improve the documentation of the evidence-based components of the evaluation and plan for an at-risk older driver. Tandem review of charts by 2 investigators occurred for 50% of the office visit encounters.

Results

A total of 98 internal medicine faculty and resident providers attended a training session during monthly clinical team meetings or a resident teaching seminar, respectively, over a period of 6 weeks. In addition to physicians, the sample included two nurse practitioners and one physician assistant.

Provider Knowledge and Preparedness Survey

Data from 86 providers were included in the final analysis, including 14 faculty and 72 residents. Data from 12 providers were excluded either because both pre- and post-surveys were not completed or pre- and postsurveys could not be correctly linked using a unique identifier. Posttest self-perceived preparedness scores were significantly higher (14.9) than pretest scores (10.9), both at the item and composite level ($p < .001$) (See Figure 3). Composite knowledge scores improved significantly after the intervention (mean score 5.3 vs. 3.5, $p < .001$). When analyzed individually, Chi-squared tests showed no statistically significant difference at the item level of the knowledge questions (See Figure 4). The post-test included a request for comments, which universally indicated PCPs anticipated using the tool in practice.

Chart Review of Driving-Related Visits

Thirty office visits (12 pre- and 18 postintervention), involving 26 patients, met the criteria for chart review analysis (Table 1). Because these driving-focused visits occurred as part of routine care, not all providers who participated in the trainings saw patients needing a driving evaluation.

### Table 1. Summary of Key Chart Review Data

<table>
<thead>
<tr>
<th>Evaluation and assessment</th>
<th>Preintervention ($n = 12$) N (%)</th>
<th>Postintervention ($n = 18$) N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driving dotphrase utilization (including note template or patient education)</td>
<td>NA</td>
<td>10 (56)</td>
</tr>
<tr>
<td>Trails B test utilization</td>
<td>2 (17)</td>
<td>6 (33)</td>
</tr>
<tr>
<td>Driving-related patient education in after visit summary</td>
<td>2 (17)</td>
<td>15 (83)</td>
</tr>
<tr>
<td>Referrals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Referrals not made (but likely indicated)</td>
<td>4 (33)</td>
<td>2 (11)</td>
</tr>
<tr>
<td>Mandatory referrals indicated</td>
<td>3 (25)</td>
<td>6 (33)</td>
</tr>
<tr>
<td>Mandatory referrals filed</td>
<td>0</td>
<td>6 (33)</td>
</tr>
</tbody>
</table>

*Note: Mandatory referrals includes 2 DMV driver evaluation referrals, the step prior to mandatory referral.*
Three patients had multiple office visits that addressed driving (2–4 office visits per patient). One faculty used the tool but did not attend the training intervention and another faculty used the tool on a patient < 65 years old; these office visits were not included in the analysis.

These 26 patients were evaluated by 9 of the 86 providers trained to use the Driving Clinical Support Tool, including 4 faculty and 5 residents. All four of the faculty who attended the training intervention and used the Driving Clinical Support Tool after the training had also evaluated at-risk older drivers prior to the availability of the tool. A single resident evaluated at-risk older drivers prior to and after the intervention; three residents used the tool after the training. Residents who used the driving EHR tool were precepted by three faculty who had attended the training intervention, but did not independently use the EHR Driving Clinical Support Tool. Therefore, a total of 8 faculty of the 14 who were trained on the tool either used it themselves or facilitated resident use of the tool. The average age of patients evaluated for driving across both pre- and postintervention period was 82.

The pre- and postintervention charts were similar in the history and exam documented, although the preferred test of executive function (Trails B) was used more frequently postintervention. Assessments consistently documented cognitive issues as a trigger for the driving evaluation. Notable differences existed in the completeness of documentation of a plan to address deficits, patient education, and state-mandated reporting; all improved after the intervention. Prior to the intervention, providers identified severe and uncontrolled deficits that met criteria for mandatory reporting to the Department of Motor Vehicle (DMV) but did not document filing a report. Postintervention, providers appropriately referred 4 mandatory reports to the DMV and submitted paperwork for 2 additional DMV evaluations, the step before mandatory revocation. Postintervention, providers more consistently made and documented referrals for appropriate follow up services and resources. Referrals or consults included ophthalmology, neurology, neuropsychiatry, geriatrics, physical therapy, occupational therapy, cognitive therapy, social work, and driving rehabilitation specialists.

Chart review showed that providers utilized the EHR tool to access educational resources to provide patients with driving-related information at the office visit; use of the provider note template was not as uniformly adopted. Only a single office visit postintervention included all components of the full provider note template and patient educational materials. Most often, providers used portions of the note template (history or exam) to guide their evaluation.

**Discussion**

This study tested a newly developed evidence-based EHR Driving Clinical Support Tool to increase PCP skill to care for at-risk older drivers. The study demonstrated that the incorporation of a topic-specific geriatric clinical tool into the EHR is feasible as an approach to deliver geriatric evidence-based practice to generalist providers. Dissemination and training on the tool successfully occurred by using existing venues for faculty and resident education. The study’s aims related to improving provider knowledge and documentation of evaluation at-risk drivers were modestly achieved. PCP knowledge and self-perceived ability to care for at-risk older drivers both increased.

A higher proportion of faculty providers (57%) than residents (5%) used the Driving Clinical Support Tool after...
the training intervention. While not an explicit aim of the study, driving-related office visits increased after the training intervention; 12 driving-related office visits occurred over the 27 months prior to the intervention, while 18 occurred in the 15 months following the intervention. The low adoption rate by providers, especially residents, after the intervention, might point to the need for continued educational exposure on a periodic basis, the testimony by early adopters speaking to the utility of the tool, or a systematic approach to identify at-risk drivers.

The Driving Clinical Support Tool did not include a tiered-algorithm for screening patients for driving risk in which widespread screening is followed by in-depth evaluation for those patients who screen positive (Betz et al., 2014). A systematic screening approach might lead to a higher rate of identified at-risk drivers, with greater uptake of the Driving Clinical Support Tool. The development of an EHR-based Driving Clinical Support Tool is timely and consistent with current efforts underway by the AMA, the American Geriatrics Society, and the National Highway Traffic Safety Administration to increase continuing medical education of providers on how to assess and counsel older drivers (Hansen, 2014).

Chart review confirmed that regulatory referrals and referral to specialists and community resources, and documentation of these referrals, increased after the training and roll out of the EHR Driving Clinical Support Tool. Postintervention, changes in patient evaluation were minimal except for the more widespread adoption of the Trails B test; but PCPs documented increased use of service integration, state reporting, and sharing of community resources with patients. Providers documented more robust plans to address driving deficits, including an emphasis on interdisciplinary referrals and increased patient education about available resources. These referrals are important to help identify deficits conducive to rehabilitation (Edwards et al., 2009; Edwards, Bart, O’Connor, & Cissell, 2010). For example, social work was used to address the impact on identity and autonomy, and occupational and cognitive therapies to independently evaluate driving abilities, including executive function. Taken together, providers addressing driving risk demonstrated improved competency as coordinators of a complex safety issue by using the EHR tool. These findings underscore the interprofessional nature of complex geriatric care that could be facilitated by clinical tools designed to help integrate care (Reuben et al., 2013).

The driving discussion with patients often occurred over several office visits, even if not all of these visits used the driving safety evaluation codes. Multiple office visits included providers referencing prior conversations with a patient about driving or providers introducing the idea of a driving evaluation but deferring the full evaluation to a future visit. Providers clearly documented difficulty with the topic and the decision to report someone; and documented awareness of the social, emotional, and logistical implications of the loss of driving privileges.

This work adds to extant literature showing the potential role of EHR clinical tools to promote evidence-based care, especially given national efforts to promote adoption and use of EHRs (Adler-Milstein et al., 2014; Englebardt & Nelson, 2002; Wallace et al., 2007). Interprofessional geriatric team care often requires the coordination of multiple disciplines, such as social work and rehabilitation services, in addition to community and governmental agencies outside of the healthcare system, to provide the most effective care for older adults, many with multiple comorbidities (Reuben et al., 2013). In this intervention, access to referrals and to knowledge of community resources was systematized and produced the greatest change in knowledge and practice. A clinical support tool built into the EHR can help synthesize large amounts of information from multiple sources and integrate interdisciplinary content, both of which are hallmarks of optimal geriatric care (McKibbon & Fridsma, 2006).

**Limitations**

The generalizability and strength of this study are limited by its small sample size and descriptive design. The use of a single group pre/posttest design increased the number of participants, but did not afford an unbiased control group. The algorithm and training did not include a systematic approach to screening at-risk older drivers (Betz et al., 2014); use of the Driving Clinical Support Tools was triggered at the provider’s discretion. Furthermore, if providers documented driving evaluations but did not use the created tools or associated ICD-9 code, these encounters were not captured in the chart review analyses.

Limitations to the study also included issues in coordinating training and data collection for busy providers. The 88% response rate is primarily explained by PCPs arriving late or leaving early from trainings. Duration of training was also limited, typical of a busy clinical practice environment. A qualitative evaluation of providers’ perceptions of usability and utility of the clinical tool could also have informed the project.

**Conclusion**

This quality improvement project demonstrated successful development of an EHR-based clinical support tool to help PCPs evaluate and manage at-risk older drivers using evidence-based standards of care. After training,
documentation of at-risk older drivers improved; care plans demonstrated evidence-based interdisciplinary plans of care; and mandatory reporting occurred when indicated. This format for dissemination of clinical information to support PCPs caring for older adults, including those trained in geriatrics and those without formal geriatric training, shows promise, and supports further EHR-based tool development to enhance PCP adoption of optimal evidence-based geriatric practices.

**Supplementary Material**

Supplementary material can be found at: [http://gerontologist.oxfordjournals.org](http://gerontologist.oxfordjournals.org).

**References**


