

Impact of Delayed Time to Advanced Imaging on Missed Appointments Across Different Demographic and Socioeconomic Factors

Dania Daye, MD, PhD^{a,b}, Emmanuel Carrodeguas, BS^b, McKinley Glover IV, MD, MHS^{a,b}, Claude Emmanuel Guerrier, MD^{a,b}, H. Benjamin Harvey, MD, JD^{a,b,c}, Efrén J. Flores, MD^{a,b}

Abstract

Purpose: The aim of this study was to investigate the impact of wait days (WDs) on missed outpatient MRI appointments across different demographic and socioeconomic factors.

Methods: An institutional review board–approved retrospective study was conducted among adult patients scheduled for outpatient MRI during a 12-month period. Scheduling data and demographic information were obtained. Imaging missed appointments were defined as missed scheduled imaging encounters. WDs were defined as the number of days from study order to appointment. Multivariate logistic regression was applied to assess the contribution of race and socioeconomic factors to missed appointments. Linear regression was performed to assess the relationship between missed appointment rates and WDs stratified by race, income, and patient insurance groups with analysis of covariance statistics.

Results: A total of 42,727 patients met the inclusion criteria. Mean WDs were 7.95 days. Multivariate regression showed increased odds ratio for missed appointments for patients with increased WDs (7-21 days: odds ratio [OR], 1.39; >21 days: OR, 1.77), African American patients (OR, 1.71), Hispanic patients (OR, 1.30), patients with noncommercial insurance (OR, 2.00-2.55), and those with imaging performed at the main hospital campus (OR, 1.51). Missed appointment rate linearly increased with WDs, with analysis of covariance revealing underrepresented minorities and Medicaid insurance as significant effect modifiers.

Conclusions: Increased WDs for advanced imaging significantly increases the likelihood of missed appointments. This effect is most pronounced among underrepresented minorities and patients with lower socioeconomic status. Efforts to reduce WDs may improve equity in access to and utilization of advanced diagnostic imaging for all patients.

Key Words: Patient engagement, health disparities, population health management, MRI, CT, missed appointment, missed care opportunity, socioeconomic

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INTRODUCTION

Advanced diagnostic imaging (ADI) is a vital component of high-quality health care in the United States, with radiologists providing significant value in supporting clinical decision making and care coordination [1]. In the era of population health management, radiologists have become increasingly important as stewards of

appropriate utilization of advanced imaging services. Radiologists have an important role and responsibility to minimize barriers and disparities in access to these high-value imaging services.

Disparities in health care access and quality across racial, ethnic, and socioeconomic lines have been well documented [2-6]. Radiology is no exception, with

^aDepartment of Radiology, Massachusetts General Hospital, Boston, Massachusetts.

^bHarvard Medical School, Boston, Massachusetts.

^cInstitute for Technology Assessment, Massachusetts General Hospital, Boston, Massachusetts.

Corresponding author and reprints: Dania Daye, MD, PhD, Department of Radiology, Massachusetts General Hospital, 55 Fruit Street, FND-208, Boston, MA 02114; e-mail: ddaye@mgh.harvard.edu.

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multiple studies demonstrating socioeconomic and demographic barriers in access to imaging services. For example, African American and Hispanic women have longer times to follow-up imaging after abnormal mammographic findings compared with their white counterparts [7-10]. Likewise, uninsured patients typically have smaller numbers of imaging studies ordered within the emergency department setting [11]. When outpatient CT or MRI examinations are ordered, underrepresented minorities and individuals with lower socioeconomic status have higher rates of missed appointments or imaging missed care opportunities for ADI [12].

Among the ADI modalities, MRI remains the most costly, with operating costs far beyond those of CT or ultrasound [13]. Multiple factors may contribute to limited access to MRI services, including cost, regulation, and economic forces of supply and demand. Access to and availability of MRI appointments may also be limited because of longer examination duration and requirements for highly trained staff members. Therefore, when an MRI appointment is missed, the losses to the health care system and to other patients who could have accessed the system sooner are magnified. Therefore, minimizing missed MRI appointments is a key target for optimization to better achieve operational and population health goals.

Increased understanding of the factors associated with missed appointments is vital to improving health care quality and value. Previous studies in other specialties have demonstrated that increased time from clinical appointment scheduling to the date of the appointment, defined in this study as wait days (WDs), is associated with increased rates of missed appointments [14-22]. Although previous studies have suggested WDs as contributing to missed appointments in radiology, the effect of WDs and socioeconomic factors on missed appointments for ADI is not fully understood [23]. Therefore, the goals of this study were (1) to assess the relationship between WDs and the rate of missed appointments for outpatient MRI examinations and (2) to determine if the effect of WDs on the rate of missed appointments is modified by selected demographic and socioeconomic factors.

METHODS

Subject Selection and Compliance

This retrospective, HIPAA-compliant study was performed at a single large quaternary urban academic medical center and all of its affiliated outpatient imaging sites. The study was approved by the institutional review board,

including a waiver of the requirement to obtain patient consent. All outpatient diagnostic MRI studies scheduled to be performed within a 12-month period (April 1, 2015, to March 30, 2016) for adult patients 18 years and older were identified from the institution's radiology information system (RIS, General Electric radiology information system, version 10.7; GE Healthcare, Little Chalfont, United Kingdom). The dates on which examinations were scheduled to be performed and the dates on which they had been ordered were extracted from the radiology information system. All inpatient and emergency department imaging was excluded, as well as any imaging performed as part of any procedure (eg, MRI-guided biopsy).

Missed Imaging Appointments

A missed appointment was defined as any scheduled imaging appointment that was not performed, was canceled, or was rescheduled before the scheduled date [12]. Each imaging appointment was treated as a unique patient encounter.

Demographics

Self-reported demographic information (age, gender, race/ethnicity, primary language, insurance payer, and home address) for each included patient was obtained from the institution's research patient data registry [24]. A small subset of patients were missing language or insurance information. As an estimated measure of socioeconomic status, income for each patient was estimated from the median household income of ZIP code from home address using 2015 census data (<http://www.census.gov>) and stratified into four groups (<\$50,000, \$50,000-\$75,000, \$75,000-\$99,999, and \geq \$100,000). Patient age was stratified into three groups for analysis: 18 to 44, 45 to 65, and \geq 65 years.

WDs

We defined WDs as the number of days between the date an examination was ordered or requested within the computerized order entry system and the date the examination was performed or scheduled to be performed (if the appointment was missed). For example, an examination that was ordered on January 1 and performed on January 15 would constitute 14 WDs. Likewise, an examination performed the same day as it was ordered constituted 0 WDs. Examinations scheduled with WDs greater than 30 days were excluded from linear regression and analysis of covariance (ANCOVA). Three

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