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Adoption and Use of Electronic Health Records and Mobile Technology by Home Health and Hospice Care Agencies

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Abstract

Objective—This report presents national estimates on the adoption and use of electronic health records and mobile technology by home health and hospice care agencies, as well as the agency characteristics associated with adoption.

Methods—Estimates are based on data from the 2007 National Home and Hospice Care Survey, conducted by the Centers for Disease Control and Prevention's National Center for Health Statistics.

Results—In 2007, 28% of home health and hospice care agencies adopted both electronic health records and mobile technology, while slightly over half (54%) adopted neither. Sixteen percent of agencies adopted only electronic health records. Adoption of both technologies was associated with number of patients served and agency type. Agencies that were for-profit or were jointly owned with a hospital were more likely to have adopted neither technology. Among agencies with electronic health records, the most commonly used functionalities were patient demographics and clinical notes. Among agencies with mobile technology, functionalities for the Outcome and Assessment Information Set (OASIS), e-mail, and appointment scheduling were the most commonly used. Similar percentages of agencies with electronic health records or mobile technology used clinical decision support systems, computerized physician order entry, electronic reminders for tests, and viewing of test results.

Keywords: point-of-care documentation • health information technology • interoperability • long-term care

Introduction

Use of health information technology, especially at the point of care, is often considered as a way to improve care coordination and quality (1). Mobile technology, such as tablet computers and personal digital assistants, represents an opportunity to gather information at the point of care. Collection of information at the care site would be especially important in home health and hospice care, where care is provided predominantly at the patient's home rather than in an institutional setting (2,3). If the agency also has an electronic health record for the patient, any information collected at the point of care through mobile technology has the potential to be integrated into the electronic health record, making the information available across provider locations. Having this information visible across all locations of care supports timely decision making and documentation. For example, having the capability to view test results at the point of care enables the provider to use these results to make timely decisions about treatment. Similarly, having the capability to order medications, treatments, or tests at the point of care eliminates a time lag in both ordering and documenting the treatment. Linkage of the information gathered through mobile technology to the electronic health record may facilitate timely decisions and concordance of patient information across locations of care. However, the utility of having both electronic health records and mobile technology is dependent on both technologies having the same functionalities and the ability to share information.

Although the adoption of each type of health information technology has been examined independently (4–6), little information is available on the

adoption of multiple types of health information within one agency and the agency characteristics associated with adoption of multiple types. This report builds on previous work and presents data on co-use of electronic health records and mobile technology by home health and hospice care agencies, and on agency characteristics associated with adoption. Estimates are also presented for the functionalities most often used in mobile technology and electronic health records, and among providers with both technologies.

Methods

Estimates in this report are based on data from the 2007 National Home and Hospice Care survey (NHHCS), conducted by the Centers for Disease Control and Prevention's (CDC) National Center for Health Statistics (NCHS). The 2007 NHHCS is one in a series of nationally representative, cross-sectional sample surveys of U.S. home health and hospice care agencies. It is designed to provide descriptive information on these agencies, their staff members, the services they provide, and the people they serve. NHHCS was first conducted in 1992 and was repeated in 1993, 1994, 1996, 1998, 2000, and 2007.

Information on NHHCS sampling, design, and other methodology is available in the Technical Notes at the end of this report, as well as in other reports (7) and online at http://www.cdc.gov/nchs/nhhcs/nhhcs_questionnaires.htm.

Data analysis

Bivariate (bivariate cross-tabulation) and multivariate (multivariate logistic regression) analyses were conducted to examine home health and hospice care agencies' adoption of electronic health records and mobile technology. The following mutually exclusive variables were created for the analyses:

- Agencies that adopted both electronic health records and mobile technology.
- Agencies that adopted only electronic health records.
- Agencies that adopted only mobile technology.
- Agencies that adopted neither electronic health records nor mobile technology.

The sample size for agencies that adopted only mobile technology was too small to create reliable estimates. Thus, no analyses were conducted to identify the factors associated with adoption of only mobile technology, and these agencies were excluded from the bivariate and multivariate analyses.

Bivariate cross-tabulations were used to determine the unadjusted percentages of agencies that adopted both electronic health records and mobile technology, agencies that adopted only electronic health records, and agencies that adopted neither technology, by selected agency characteristics (Table 1). Adjusted percentages controlling for agency characteristics were calculated using three multivariate logistic regression models. The first model produces the adjusted percentage of agencies that adopted both technologies; the second produces the adjusted percentage of agencies that adopted only electronic health records; and the third model produces the adjusted percentage of agencies that adopted neither technology. In each model, agencies that adopted only mobile technology were excluded from the analyses.

Control variables in the models include type of care offered, total number of services offered, percentage of revenue from Medicare, total number of patients, administrator or director tenure at the agency, joint ownership, agency type, and chain affiliation. These variables were chosen because in previous research they were found to be associated with adoption of electronic health records (4–6). The regression models are then used to predict marginal probabilities (adjusted percentages) for the average provider of home health or hospice care, or both, with a given characteristic (e.g., for-profit agencies) and with the specific technology adoption status (e.g., adoption of only electronic health records), while controlling for other variables in the model.

Differences between the results of bivariate (unadjusted) and adjusted analyses are due to the significant associations between the variables included in the adjusted model. For example, chain affiliation and type of care offered are significantly associated (8). Because significant associations were seen among the control variables included in the full models, additional models were run. One set of models included only the variables with significant bivariate associations. In another series of models, the variables with the most correlations with other variables were dropped sequentially, in the following order: ownership, joint ownership, percentage of revenue from Medicare, and type of care offered. The results of these additional models are discussed but are not shown.

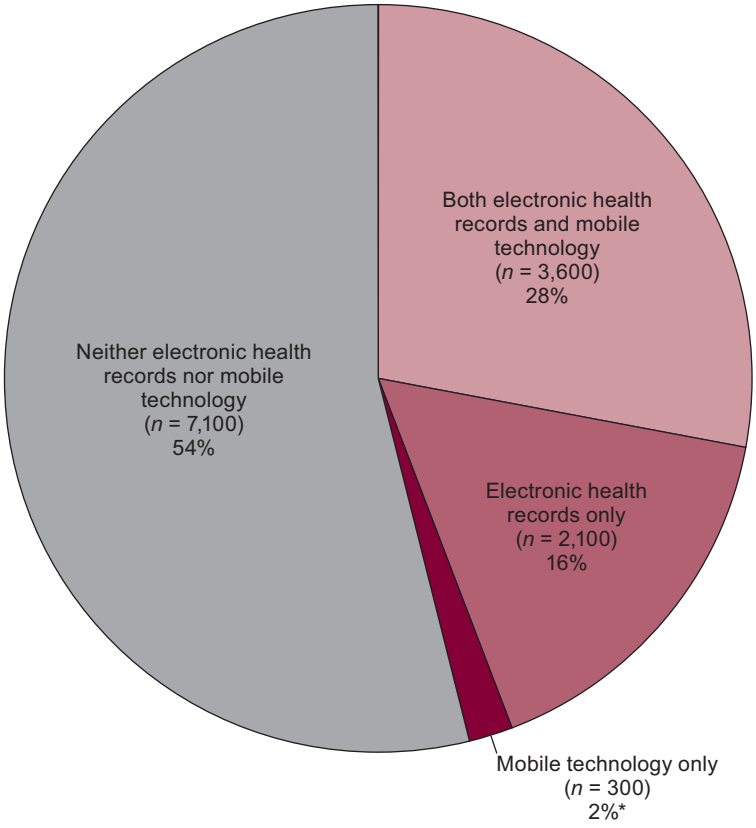
The percentages of agency adoption of mobile technology and electronic health record functionalities were calculated for the following categories:

- Agencies that adopted mobile technology regardless of adoption of electronic health records.
- Agencies that adopted electronic health records regardless of adoption of mobile technology.
- Agencies that adopted both technologies.

The weighted percentages of nonresponse (''don't know'' and ''refused'') for all variables used in the analyses were less than 10%. The weighted percentage of cases with missing data was less than 1% for functionalities on electronic health records and mobile technology; 1% for total number of patients, joint ownership, and total number of services offered; 5% for whether the agency had an electronic health record; 7% for whether the agency had mobile technology and for administrator or director tenure at agency; and 8% for the percentage of revenue from Medicare. Agency type and type of care offered had no cases with missing data. Cases with missing information on any of the variables used in the analyses were dropped (67 cases were dropped, resulting in a sample of 969 cases being used in the analyses). This yielded a

weighted sample size of 13,100 cases (91% of the total weighted sample).

Weights that take into account the sample stages with adjustments for nonresponse were used to produce national estimates of agencies providing home health and hospice care. Differences between subgroups were evaluated with chi-square tests at the $p = 0.05$ level for differences in percentages and percent distributions. All comparisons reported in the text are statistically significant unless otherwise indicated. Comparisons not mentioned may or may not be statistically significant. Data analyses were performed using the statistical packages SAS, version 9.2 (9) and SUDAAN, version 10.0 (10). Because estimates were rounded to the nearest hundred, individual estimates may not sum to totals.



* Estimate is unreliable.
NOTES: A weighted total of 13,100 agencies were analyzed. Figure excludes cases with missing data. See Data Analysis section for details.
SOURCE: CDC/NCHS, National Home and Hospice Care Survey, 2007.

Figure 1. Home health and hospice care agencies' adoption of electronic health records and mobile technology: United States, 2007

Results

Adoption of electronic health records and mobile technology

Twenty-eight percent of home health and hospice care agencies have adopted both electronic health records and mobile technology (Figure 1). Slightly over one-half (54%) of the agencies had neither an electronic health record nor mobile technology. Sixteen percent adopted only electronic health records, whereas 2% (an unreliable estimate) adopted only mobile technology. In other words, 44% of agencies adopted electronic health records (16% only electronic health records and 28% both technologies), whereas 30% adopted mobile technology (2% only mobile technology and 28% both technologies).

Agency characteristics associated with adoption of both electronic health records and mobile technology

In unadjusted analyses (Table 1), agency adoption of both electronic health records and mobile technology was associated with all the variables included in the analyses. Agencies were more likely to adopt both technologies if the agency offered both home health and hospice care, was not part of a chain, had administrators with a tenure of 71 or more months (rather than 25–70 months), had 50 or more patients, had revenue from Medicare in the middle tertile (52%–87%) of total revenues, offered 14 or more services, were either nonprofit or government-owned, or were jointly owned by either a hospital or a health care system. The largest effect was for agency type: where 8% of agencies that were for-profit adopted both technologies, in contrast to voluntary nonprofits (67%) and government agencies (51%). Total number of patients and joint ownership had effects of similar magnitude. Among agencies with fewer than 50 patients, 9% adopted both technologies, but there was no difference in adoption between agencies with 50–99 patients (32%) and those with 100 or more patients (43%). Independent agencies were less likely to adopt both technologies (18%), compared with agencies jointly owned with a hospital (51%) or a health care system (60%).

In adjusted analyses (Table 2), agency adoption of both electronic health records and mobile technology was associated with the number of current patients served and with ownership. Agencies that had 50 or more patients and were either nonprofit or government-owned were more likely to adopt both technologies, compared with all other agencies that had adopted only electronic health records or adopted neither technology, while controlling for other variables. Twelve percent of agencies with fewer than 50 patients

adopted both technologies, compared with 31% of agencies with 50–99 patients and 32% of agencies with 100 or more patients. Ten percent of for-profit agencies adopted both technologies, compared with 54% of voluntary nonprofit agencies and 50% of government agencies.

Models in which ownership, joint ownership, percentage of revenue from Medicare, and agency type were dropped sequentially from the full model were also run. When ownership was dropped, adopting both technologies was associated with joint ownership, administrator tenure, number of patients, and chain membership. Percentage of revenue from Medicare, number of patients, administrator tenure, and chain membership were significant when joint ownership was also removed from the model. When percentage of revenue from Medicare was also removed, type of care provided, number of patients, administrator tenure, and chain membership were significant. When all four of the most closely associated variables (ownership, joint ownership, percentage of revenue from Medicare, and type of care provided) were removed from the model, the number of services offered, number of patients, administrator tenure, and chain membership were all associated with adopting both types of technology. (Data not shown.)

Agency characteristics associated with adoption of only electronic health records

In unadjusted analyses, adoption of only electronic health records was associated with type of care offered by the agency, number of patients, agency type, and joint ownership (Table 1). Compared with all other agencies, agencies that adopted only electronic health records were more likely to offer home health care only (18%) rather than both home health and hospice care (6%); to have fewer than 50 patients (28%) rather than 50–99 patients (10%); to be for-profit (21%) rather than voluntary nonprofit (7%); or to be independent (19%) rather than jointly owned with a hospital (6%).

In adjusted analyses (Table 2), an agency's adoption of only electronic health records (compared with adopting both or neither technology) was not associated with any of the variables used in the analyses.

Adjusted analyses that included only the four variables with significant bivariate associations (type of care offered by the agency, number of patients, agency type, and joint ownership) did not improve the overall fit compared with the full model. Similarly, when ownership, joint ownership, percentage of revenue from Medicare, and type of care offered were dropped sequentially, none of those models improved the fit. (Data not shown.)

Agency characteristics associated with adoption of neither electronic health records nor mobile technology

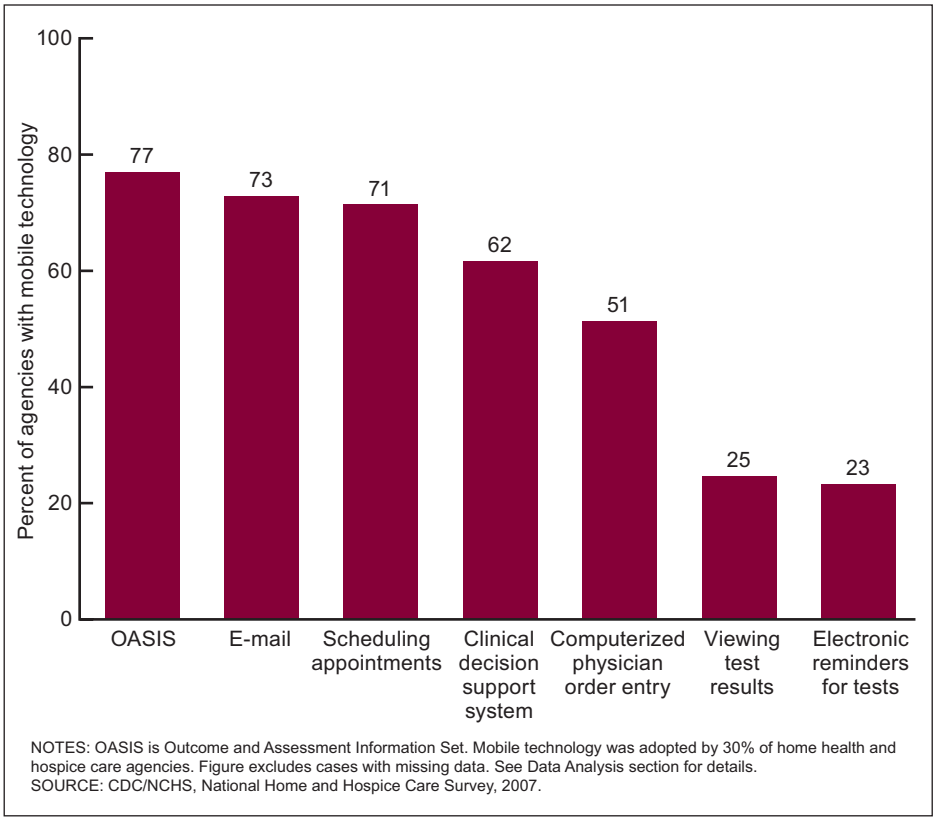
In unadjusted analyses, agency adoption of neither type of technology was associated with type of care offered, percentage of revenue from Medicare, number of services offered, agency type, and joint ownership (Table 1). Agencies were more likely to adopt neither technology if they provided either home health care only or hospice care only rather than both types of care; if their percentage of revenue from Medicare was in the highest tertile (88% or more) of total revenues rather than the middle tertile (52%–87%); if they offered 10–13 services rather than 14 or more; if they were for-profit rather than nonprofit or government-owned; and if they were independent or jointly owned with a hospital rather than jointly owned with a health care system and other. The largest effects were seen with agency type, where 71% of for-profit agencies adopted neither technology, compared with 26% of voluntary nonprofits and 37% of government-owned agencies. Joint ownership also showed strong effects, with 62% of independent agencies adopting neither technology, compared with 44% of agencies affiliated with a hospital and 23% affiliated with a health care system.

In adjusted analyses, agency adoption of neither type of technology, rather than both or electronic health records only (Table 2), was associated with agency type and joint ownership. Agencies that were for-profit and were independent or jointly owned with a hospital were more likely to have adopted neither type of technology than to have adopted both technologies or only electronic health records.

In adjusted analyses, which included only the variables with significant bivariate associations with adoption of neither technology (type of care offered, percentage of revenue from Medicare, number of services offered, agency type, and joint ownership), the same variables found significant in the full model (agency type and joint ownership) were significant in the smaller model. The adjusted percentages from this smaller model were very similar to the adjusted percentages in the full model. When ownership, joint ownership, and percentage of revenue from Medicare were dropped sequentially, none of the remaining variables were significant. However, when type of care offered was dropped as well, then the number of services offered became significant. Adoption of neither technology was associated with offering 10–13 services, compared with 13 or more. (Data not shown.)

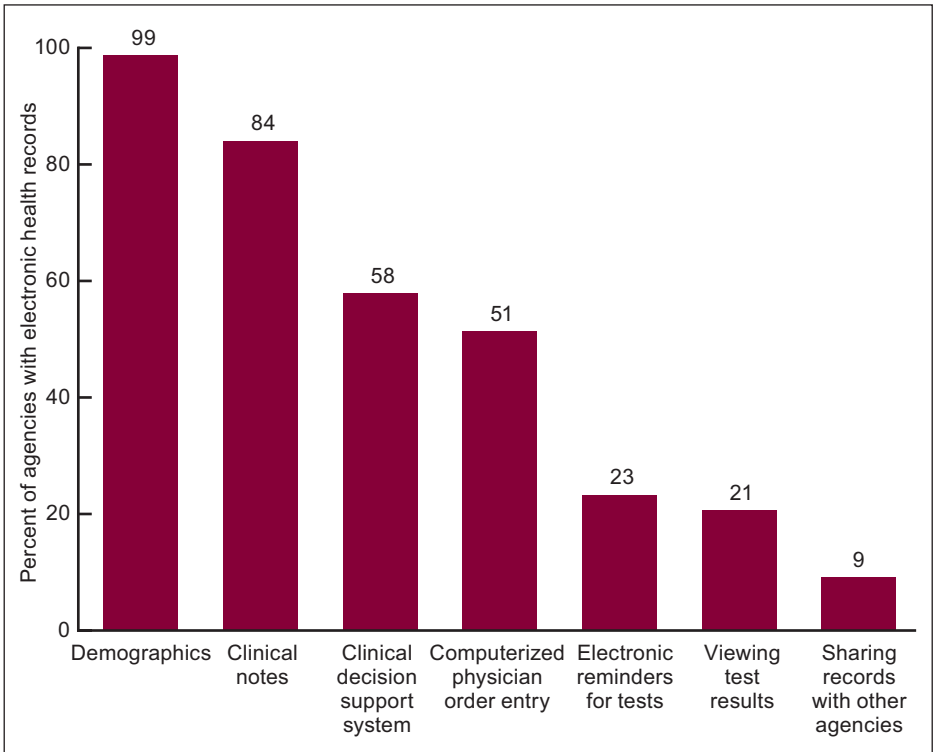
Functionalities most often used in mobile technology

Most agencies with mobile technology (agencies adopting both mobile technology and electronic health records or just mobile technology) used functionalities related to the Outcome and Assessment Information Set (OASIS) (77%), e-mail (73%), appointment scheduling (71%), clinical decision support system (62%), and computerized physician order entry (51%) (Figure 2). Approximately one-quarter used mobile technology for viewing test results (25%) or for electronic reminders for tests (23%).



NOTES: OASIS is Outcome and Assessment Information Set. Mobile technology was adopted by 30% of home health and hospice care agencies. Figure excludes cases with missing data. See Data Analysis section for details.
SOURCE: CDC/NCHS, National Home and Hospice Care Survey, 2007.

Figure 2. Home health and hospice care agencies with mobile technology, by functionality used: United States, 2007



NOTES: Electronic health records were adopted by 44% of home health and hospice care agencies. Figure excludes cases with missing data. See Data Analysis section for details.
SOURCE: CDC/NCHS, National Home and Hospice Care Survey, 2007.

Figure 3. Home health and hospice care agencies with electronic health records, by functionality used: United States, 2007

Functionalities most often used in electronic health records

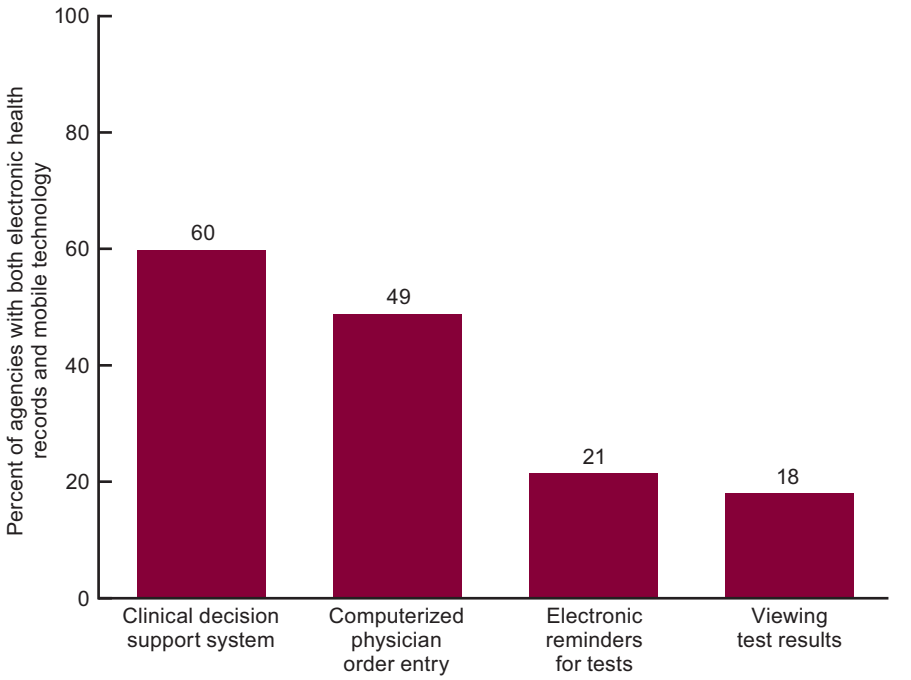
The majority of agencies with electronic health records (agencies adopting both mobile technology and electronic health records or only electronic health records) used functionalities for patient demographics (99%), clinical notes (84%), clinical decision support systems (58%), and computerized physician order entry (51%) (Figure 3). Approximately one-fifth of agencies with electronic health records used electronic reminders for tests (23%) and viewed test results electronically (21%). Nine percent of agencies with electronic health records used functionalities to share records with other agencies.

Functionalities most often used by home health and hospice care agencies with both electronic health records and mobile technology

Four functionalities included on the 2007 NHHCS were included in questions on both electronic health records and mobile technology: clinical decision support systems, computerized physician order entry, electronic reminders for tests, and viewing of test results. Among home health and hospice care agencies with both technologies, of these four functionalities, clinical decision support systems was most commonly used on both types (60%), followed by computerized physician order entry (49%). The agencies also used both technologies for electronic reminders for tests (21%) and for viewing of test results (18%) (Figure 4).

Summary

In 2007, 28% of home health and hospice care agencies had adopted both electronic health records and mobile technology, 16% had adopted only electronic health records, 2% had adopted only mobile technology, and 54% had adopted neither.



NOTES: Both electronic health records and mobile technology were adopted by 28% of home health and hospice care agencies. Figure excludes cases with missing data. See Data Analysis section for details.
SOURCE: CDC/NCHS, National Home and Hospice Care Survey, 2007.

Figure 4. Home health and hospice care agencies with both electronic health records and mobile technology, by functionalities used in both technologies: United States, 2007

In bivariate (unadjusted) analyses, adoption of both electronic health records and mobile technology was associated with all the variables included in the analyses, whereas adoption of neither technology was associated with type of care, percentage of revenue from Medicare, number of services offered, agency type, and joint ownership. Adoption of only electronic health records was associated with type of care offered, number of patients, agency type, and joint ownership.

In adjusted analyses, adoption of both electronic health records and mobile technology was associated with number of patients and agency type, whereas adoption of neither technology was associated with agency type and joint ownership. However, adoption of only electronic health records was not associated with any of the variables included in the model, suggesting that factors not examined in this study may be driving adoption of only electronic health records. Agency type was associated with adoption of both types of technology and with adoption of neither type of technology. Nonprofit and government-owned agencies were much more likely to adopt both types of technology than for-profit agencies; conversely, for-profit agencies were much more likely to adopt neither technology. The results also suggest that a threshold of 50 patients is associated with adoption of both types of health information technology.

Agencies that adopted only mobile technology may differ from those adopting only electronic health records or both technologies. However, due to the small sample size of agencies that adopted only mobile technology in this study, it was not possible to conduct further analyses of these agencies.

Among agencies with electronic health records (whether or not they also had mobile technology), the most commonly used functionalities were for patient demographics and clinical notes. Among agencies with mobile technology (whether or not they also had electronic health records), OASIS reporting, e-mail, and appointment scheduling were the most commonly used. Functionalities included in the questionnaire for both electronic health records and mobile technology (clinical decision support systems, computerized physician order entry, viewing test results, and electronic reminders for tests) were used by similar proportions in both types of technology. Among agencies with both technologies, clinical decision support systems and computerized physician order entry were used by at least one-half of agencies. Functionalities such as clinical decision support systems or computerized physician order entry may lead to improved coordination of care delivered at the point of care among home health and hospice care agencies by incorporating information gathered through mobile technology into the electronic health record.

Several limitations should be considered when interpreting the study results. Because NHHCS is based on self-report, interpretation of functionalities may vary among agencies. Agencies may have had additional functionalities that were not included as specific options on the questionnaire. These would not have been captured unless the agency provided the specific functionality as a write-in. (This occurred with clinical documentation on mobile technology. See Technical Notes, ''Definition of Terms.'') An underlying assumption of the potential benefits of co-use of electronic health records and mobile technology is that data can be transferred within the agency between different types of technology and that the same software (e.g., for clinical decision support systems) is available for both technologies. Data to test this assumption were not available from the survey.

Proponents believe that health information technology has the potential to improve both quality and coordination of care (1)—a major concern in home health care (11). Adoption of mobile technology and electronic health records is increasing, as is research on the impact of these technologies on the quality and

coordination of care in home and hospice (12–18).

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Table 1. Unadjusted percentages of home health care and hospice care agencies that have adopted both mobile technology and electronic health records, electronic health records only, or neither, by agency characteristics: United States, 2007

Selected characteristic	Both electronic health records and mobile technology	Electronic health records only	Neither electronic health records nor mobile technology
Total, *n*	3,600	2,100	7,100
Type of care offered			
Home health care only	[1]22	[2]18	59
Hospice care only	[1]35	14	51
Home health and hospice care	[1]60	6	[1]33
Chain affiliation			
Part of a chain	17	19	64
Not part of a chain	[1]33	16	52
Adminstrator or director tenure at agency			
24 months or less	26	21	53
25–70 months	17	19	65
71 months or more	[3]39	10	51
Total number of patients			
49 or fewer	[1]9	[4]28	63
50–99	32	10	58
100 or more	43	12	45
Percent of revenue from Medicare			
51% or less	20	24	56
52%–87%	[1]42	11	[5]47
88% or more	16	17	66
Total number of services offered			
9 or fewer	14	26	60
10–13	27	11	[6]62
14 or more	[1]43	13	45
Agency type			
For-profit	[1]8	[7]21	[1]71
Voluntary nonprofit	67	7	26
Government and other	51	12	37
Joint ownership			
Independent	[1]18	[8]19	[1]62
Hospital	51	6	[1]44
Health care system and other	60	16	[1]23

[1]Significantly different from other categories at $p < 0.05$.
[2]Significantly different at $p < 0.05$ from agencies offering both home health and hospice care.
[3]Significantly different at $p < 0.05$ from administrator tenure of 25–70 months.
[4]Significantly different at $p < 0.05$ from agencies with 50–99 patients.
[5]Significantly different at $p < 0.05$ from agencies with 88% or more of revenue from Medicare.
[6]Significantly different at $p < 0.05$ from agencies offering 14 or more services.
[7]Significantly different at $p < 0.05$ from voluntary nonprofit agencies.
[8]Significantly different at $p < 0.05$ from agencies owned jointly with a hospital.

NOTE: Percentages may not sum to 100 across rows because of rounding.

SOURCE: CDC/NCHS, National Home and Hospice Care Survey, 2007.

Table 2. Adjusted probabilities of home health and hospice care agencies that have adopted both mobile technology and electronic health records, electronic health records only, or neither, by selected agency characteristics: United States, 2007

Selected characteristic	Both electronic health records and mobile technology	Electronic health records only	Neither electronic health records nor mobile technology
Total, *n*	3,600	2,100	7,100
Type of care offered			
Home health care only	27	18	55
Hospice care only	22	18	65
Both home health and hospice care	27	10	57
Chain affiliation			
Part of a chain	26	16	60
Not part of a chain	26	18	55
Adminstrator or director tenure at agency			
24 months or less	27	20	51
25–70 months	21	19	60
71 months or more	28	13	58
Total number of patients			
49 or fewer	[1]12	25	59
50–99	31	11	58
100 or more	32	15	50
Percent of revenue from Medicare			
51% or less	22	22	54
52%–87%	27	17	56
88% or more	28	14	60
Total number of services offered			
9 or fewer	21	21	53
10–13	26	12	64
14 or more	29	18	53
Agency type			
For-profit	[1]10	19	[1]69
Voluntary nonprofit	54	11	29
Government and other	50	15	36
Joint ownership			
Independent	25	18	56
Hospital	25	9	65
Health care system and other	33	23	[2]38

[1]Significantly different from other categories at $p < 0.05$.

[2]Significantly different at $p < 0.05$ from agencies jointly owned with a hospital.

NOTES: The adjusted probabilities (predicted marginals) represent the percentage of home health and hospice care agencies with a given characteristic, by adoption of electronic health records and mobile technology, while controlling for other variables in the logistic regression model. The variables controlled for in the model are type of care offered, chain affiliation, administrator or director tenure at agency, total number of patients, percent of revenue from Medicare, total number of services offered, agency type, and joint ownership. Percentages may not sum to 100 across rows because of rounding.

SOURCE: CDC/NCHS, National Home and Hospice Care Survey, 2007.

Technical Notes

Data source and methods

Data from the 2007 NHHCS were used for these analyses. The survey used a stratified, two-stage probability design. The first stage was the selection of home health and hospice care agencies from the sampling frame of over 15,000 agencies representing the universe of agencies providing home health and hospice care services in the United States. Agencies affiliated with hospitals, government entities, retirement centers, or similar institutions where the agencies maintained financial and patient records independent of the larger institution were included in the frame. The primary sampling strata of agencies were defined by agency type and metropolitan statistical area status. Within these sampling strata, agencies were sorted by census region, ownership, certification status, state, county, ZIP code, and size (number of employees). For the 2007 NHHCS, 1,545 agencies were sampled with probability proportional to size.

Data collection

Data for the 2007 NHHCS were collected through personal interviews with agency directors and staff who used administrative records to answer questions about the agency, staff, services, and programs. Interviews were complete for 1,036 agencies. The unweighted response rate was 71%. The response rate weighted by the inverse of the probability of selection was 59%. A detailed description of the sampling design, data collection, and response rates for NHHCS is provided elsewhere (7) and online at http://www.cdc.gov/nchs/nhhcs/nhhcs_questionnaires.htm.

Estimation

Because NHHCS statistics are based on a sample, they will differ somewhat from the data that would have been obtained if a complete census had been taken using the same definitions, instructions, and procedures. However, the probability design of NHHCS permits the calculation of sampling errors. The standard error of a statistic is primarily a measure of sampling variability that occurs by chance because only a sample, rather than the entire population, is surveyed. The standard error also reflects part of the variation that arises in the measurement process but does not include any systematic bias that may be in the data or any other nonsampling error. The chances are about 95 in 100 that an estimate from the sample differs from the value that would be obtained from a complete census by less than twice the standard error. More information on estimation is available at http://www.cdc.gov/nchs/data/nhhcsd/NHHCS_NHHAS_web_documentation.pdf.

Estimates are considered reliable if they are based on 60 or more sample cases and the relative standard error (RSE) is less than 30%. Estimates based on 30–59 cases, or based on more than 59 cases but with an RSE exceeding 30%, are indicated as unreliable in the text, tables, and figures.

Definition of terms

Adoption of mobile technology—Based on agency self-report at the time of interview and defined by a ''yes'' response to the question, ''Does this agency's staff use any system for Electronic Point of Care Documentation? Include PDAs (Personal Digital Assistants), Notebook PCs, or other portable handheld devices.''

Mobile technology functionalities—Based on agency self-report of use of specific functionalities at the time of interview and defined by a ''yes'' response to the question, ''Are these devices used for any of the following?'' Options were ''yes'' or ''no'' for each functionality. Functionalities included computerized physician order entry for prescriptions or pharmacy, laboratory work, or tests; viewing of test results; electronic reminders for tests; clinical decision support systems or reference systems; e-mail communication with agency staff or other staff; scheduling appointments or visits; OASIS reporting; and other. Based on write-in responses to the Other category, clinical documentation was added as a functionality; however, the estimate is unreliable due to small sample size and is not presented in this report.

Adoption of an electronic health record system—Based on agency self-report at the time of interview and defined by a ''yes'' response to the question, ''Does this agency currently have an Electronic Medical Records system? This is a computerized version of the patient's medical information used in the management of the patient's health care. Exclude electronic records used only for billing purposes and required documentation such as OASIS files.''

Electronic health record functionalities—Based on agency self-report of use of specific functionalities at the time of interview and defined by a ''used'' response to the following: ''With this agency's current electronic medical records system, please indicate for each component listed below, whether it is used, available but not used, or not available.'' Functionalities included computerized physician order entry for prescriptions, laboratory work, and tests; viewing of test results (e.g., chest x-rays); patient demographics; electronic reminders for tests (e.g., laboratory tests and imaging); clinical decision support systems of contraindications, allergies, guidelines, etc.; clinical notes; public health reporting (notifiable diseases); and sharing medical records electronically with other agencies. Of the 1,036 agencies that participated in the 2007 NHHCS, one agency reported having an electronic health record system but that none of the functionalities were used, although they were available. Because the question about mobile technology asks about the use of the functionality, only ''used'' responses for electronic health record functionalities are included, to allow clear comparison with mobile technology functionality use.

Type of care offered—Indicates whether the agency offered home health care only, hospice care only, or both home health and hospice care.

Chain affiliation—Indicates whether the agency was part of a chain

of two or more agencies under one ownership or operation.

Administrator or director tenure at agency—Based on responses to the question at the time of interview, ''About how long has he/she been the Director/Administrator at this agency?'' Administrator tenure was converted from continuous variables to a categorical variable with three levels: 24 months or less, 25–70 months, and 71 months or more

Total number of patients—Refers to the number of patients receiving care from the agency at the time of interview. For agencies providing both home health and hospice care, the total number of patients included both types of patients. The total number of patients was converted to a categorical variable with three levels: 49 or fewer patients, 50–99 patients, and 100 or more patients.

Percentage of revenue from Medicare—Based on the agency's estimate of what percentage of its overall patient care revenue was from Medicare. This variable was divided into three categories: 51% or less, 52%–87%, and 88% or more.

Total number of services offered—Calculated as the sum of ''yes'' responses when the agency was asked whether they offered a specified service. Services included complementary and alternative medicine, dietary and nutritional services, enterostomal therapy, IV therapy, physician services, podiatry services, skilled nursing services, wound care, durable medical equipment, pharmacy services, occupational therapy, physical therapy, respiratory therapy, speech therapy or audiology, companion services, continuous home care, homemaker services, Meals on Wheels, assistance with activities of daily living, transportation services, volunteer services, pastoral services, mental health services, referral services, respite care, medical social services, ethical issues counseling, grief or bereavement counseling, and other. The number of services was converted from a continuous variable to a three-level categorical variable: 9 or fewer services, 10–13 services, and 14 or more services.

Agency type—This variable has three categories: for-profit, voluntary nonprofit, and government and other (e.g., city, county, state, or federal government, and Department of Veterans Affairs).

Joint ownership—This variable was collapsed into three categories: independent, jointly owned with hospital, and jointly owned with health care system and other. Other includes outpatient medical or surgical center, managed care organization, and skilled nursing facility.

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