Evaluating Living Situation, Occupation, and Hobby/Activity Information in the Electronic Health Record

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Introduction: Social and individual behavioral factors play an important role in diagnosis, prevention, health outcomes, and quality of life[1,2]. As defined by the World Health Organization, "social determinants of health are the conditions in which people are born, grow, live, work and age"[3]. Living situation information, such as residence type, with whom the patient lives, housing density, physical living conditions, and social support, all have been shown to have significant impact on a patient's health outcomes[4,5]. In addition, occupation and hobbies/activities can adversely impact health[6,7]. Within electronic health record (EHR) systems, social determinant documentation may be entered as structured data or unstructured text (e.g., in clinical notes or free-text data entry fields). Building upon previous work[8], the goal of this study was to evaluate the documentation of living situation, occupation, and hobbies through analysis of specific ancillary notes as well as other structured and unstructured sections of the EHR.

Methods: Progress and consult notes from a publicly accessible data source, MTSamples.com (MTS), and the University of Pittsburgh Medical Center (UPMC) NLP Repository were annotated to extract general social history sections and sentences. Each sentence was then annotated using an annotation schema developed specifically for living situation, occupation, and hobbies/activities (Table 1). These "training" data served to validate the annotation schema, which was then used to annotate inpatient social work notes from the Epic® Systems Corporation EHR in 2013 at Fairview Health Systems (FHS) which included patients who consented to have their medical records used for research. Specifically, 100 social work inpatient notes were randomly extracted from the EHR and annotated to classify living situation, occupation, and hobbies/activities information. Lastly, the EHR was queried for structured occupation information documented within the social history module for all inpatients for 2013.

Results: A total of 691 progress and consult notes were evaluated from MTS (n=491) and UPMC (n=200). A total of 558 social history annotations were then further classified, by consensus of two reviewers, into 10 topic areas covering living situation, occupation, and hobbies/activities as well as related exposures. This analysis identified 546 unique sentences related to the topic areas. Of the total notes evaluated 10.4% had at least one sentence related to residence, 20.2% had references to living density or cohabitation, and approximately 24% had sentences related to occupation (Table 2). Evaluation of the 100 social worker notes showed 40.0% had at least one sentence related to residence, 39.0% had social support, and 34.0% had living density. Lastly, the structured field for occupation from the FHS EHR was found to be populated in only 0.03% of inpatients in 2013.

Discussion: Our evaluation of the MTS and UPMC progress notes demonstrates that the topic areas of living situation, occupation, and hobby/activities are being documented in the EHR with occupation-related sentences found in 24% and living density in 20.2% of notes. Exposure-related sentences are found much less frequently. The social work notes showed higher levels of documentation especially related to Social Support. Evaluation of additional notes and note types including physical and occupational therapy as well as other structured, semi-structured, and unstructured sections of the chart is in progress.

Conclusion: Social determinants are important considerations in the provision of care and are also becoming more important as in terms of population health management. The contributions of this work represent a first step towards further informing biomedical standards for the representation of social determinants in the EHR, as well as the design of clinical documentation tools.

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Table 1: Annotation Schema for Living Situation, Occupation, and Hobbies/Activities

Topic	*Definition (Example Sentence)*
Residence	Dwelling types, physical residence. (*"The patient lives at a skilled nursing facility."*)
Living Conditions	Sanitation, safety. (*"The patient was living in a home which was reported to us to be without any heat or light and a good deal of excrement and urine in the building.")*
Living Density	With whom the patient lives. (*"The patient lives with her daughter.")*
Social Support	Assistance in support of care or activities of daily living. (*"The patient lives with her family being helped by the family and friends.")*
Living Situation Exposure	Exposures related to living situation. (*"He lives in a home where there are smokers."*)
Animals	Presence of animals in residence, domesticated animals as well as livestock. (*"At this time, there is also exposure to indoor cats and dogs."*)
Occupation	A regular activity performed for payment, career, profession, vocation, employment, or non-paid vocations such as full-time student, stay-at-home mom, retired, unemployed. (*"He was an IT software developer, but he has been out of work."*)
Occupation Exposure	Exposures related to occupation. (*"This is a 91-year-old male with a previous history of working in the coalmine and significant exposure to silica…"*)
Hobby / Activity	A hobby or activity, paid or non-paid, engaged in as a means of passing time; an avocation. (*"Hobbies: Computers, hiking, camping, fishing."*)
Hobby / Activity Exposure	Exposures related to hobbies or activities. (*"He likes to refinish old furniture so he works extensively with lead paint."*)

Table 2: Percent of total notes and number of sentences. [Percent of total unique notes (# individual sentences)]

	MTS	*UPMC*	*TOTAL "Training"*	*FHS*
Residence	6.3% (35)	20.5% (48)	10.4% (83)	40.0% (54)
Living Conditions	0% (0)	1.5% (6)	0.4% (6)	0% (0)
Living Density	17.1% (85)	28.0% (58)	20.2% (143)	34.0% (34)
Social Support	2.2% (12)	5.5% (14)	3.2% (26)	39.0%(39)
Living Situation Exposure	3.3% (17)	1.5% (3)	2.8% (20)	0% (0)
Animals	3.1% (15)	1.5% (4)	2.6% (19)	1.0% (1)
Occupation	26.5% (161)	18.0% (40)	24.0% (201)	27% (27)
Occupation Exposure	0.6% (3)	1.0% (2)	0.7% (5)	0% (0)
Hobby / Activity	6.9% (41)	1.0% (2)	5.2% (43)	15% (15)
Hobby / Activity Exposure	0% (0)	0% (0)	0% (0)	0% (0)
Total Sentences	369	177	546	113

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