Exploring Mental Model Differences Between Firefighters and Public Health Researchers to Inform Exposure Reporting System Design

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Abstract: Firefighters are exposed to various risks on-the-job and are at greater risk of contracting cancer. Recording on-the-job exposures will help identify when, where and under what circumstances firefighters are exposed to carcinogens and may then facilitate efforts aimed at cancer prevention and treatment. Although Fire Service personnel will complete the exposure reports, academic researchers will subsequently analyze the data collected. Therefore, it is important to validate if the report variables and user data collected is acceptable across system users (i.e. firefighters and public health researchers). The purpose of this study was to determine comprehension for the content, to identify user preferences for the order of report variables, and to examine group differences that may be influenced by experience and context. The study employed cognitive research techniques, namely the mental models approach (sorting tasks) to explore ways in which information about exposure events is structured in the firefighters memory and evaluated whether information relatedness and presentation priorities are dependent upon the population tested (firefighters & researchers). Thirty firefighter sorted 68 cards into an average of 7 groups. The median task time was 34 minutes to complete the study. Thirty public health researchers sorted 68 cards into an average of 6 groups. On average, researcher participants took 36 minutes to complete the study. Hierarchical cluster analysis was performed to identify key relationships between individual items. Study results showed how firefighters organize event-based information when describing occupational exposure incidents. For this type of information, firefighters followed a chronological pattern of organization by arranging information according to representations of a particular time period. The organizational strategy was to divide topics into "before-during-after" segments. Strong mental models in organizing report content by phases of work from the incident call, to activities on the scene, through decontamination procedures on scene and at the station. This strategy differed from the researchers. For the majority (55%) of public health researchers followed a similarity-based categorization strategy, focused on terminology co-occurrence. In addition to exploring organization schemas for exposure reporting concepts, researcher participants contributed to the study by identifying necessary, but missing items need for exposure reporting and investigation of carcinogenic risk.