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Smart homes and novel indicators to inform an evidence-based population health intervention for aging in place and design of a community health registry

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Objective

This study aims to (1) characterize the state of smart homes research as a population health intervention to support aging in place through systematic review and classification of scientific literature using an evidence-based public health (EBPH) typology and (2) identify novel indicators of health captured by monitoring technologies to inform design of a community health registry.

Introduction

The critical need for population-level interventions to support the health needs of the growing population of older adults is widely recognized (1). In addition, there is a need for novel indicators to monitor wellness as a resource for living and a means for prediction and prevention of changes in community health status (2). Smart homes, defined as residential infrastructure equipped with technology features that enable passive monitoring of residents to proactively support wellness, have the potential to support older adults for independence at the residence of their choice. However, a characterization of the current state of smart homes research as a population health intervention is lacking. In addition, there is a knowledge translation gap between the smart homes research and public health practice communities.

The EBPH movement identifies three types of evidence along a continuum to inform population health interventions: Type 1 (something should be done), Type 2 (this should be done) and Type 3 (how it should be done) (3). Type 2 evidence consists of a classification scheme for interventions (emerging, promising, effective and evidence based) (3). To illustrate typology use with an example: the need for population health interventions for aging populations is well known (Type 1 evidence), many studies show that smart home technologies can support aging in place (Type 2 evidence), but there are few, if any, examples of smart homes as population health interventions to support aging in place (Type 3 evidence).

Our research questions for this systematic review are as follows:

1) What categories of Type 2 evidence from the scientific literature uphold smart homes as an EBPH intervention?
2) What are the novel health indicators identified from smart home studies to inform design of a community health registry that supports prediction and prevention of negative changes in health status?
3) What stakeholders are reported in studies that contribute Type 2 evidence for smart homes as an EBPH intervention?
4) What gaps exist between Type 2 and Type 3 evidence for smart homes as an EBPH intervention?

Methods

Our search methodology includes searches of MEDLINE, CINAHL and IEEE conference proceedings databases to provide coverage across a literature that is found in many disciplines and is not well-indexed. As the term 'smart home' is not well-defined, our search terms also include 'telemedicine', 'telehealth', 'e-health', 'health monitoring', 'gerontechnology' and 'gerotechnology' in combination with 'older adult', 'elderly', 'aging', 'ageing', 'community-dwelling' and 'senior'. Our inclusion criteria include any study that describes a technology designed for an older adult audience to support wellness management through social, spiritual, physical or cognitive means (4). Our exclusion criteria include smart homes designed for efficiency and nonhealth-related surveillance technologies.

Results

Initial search results indicate many studies that can be classified as Type 2 evidence along the continuum of emerging, promising, effective and evidence-based smart home interventions. Initial findings are that Type 3 evidence is lacking and public health policy makers are underrepresented.

Conclusions

Early analysis of complete search results will be presented for (1) categorizations of evidence according to the evidence-based public health typology, (2) enumeration of stakeholders reported in included studies and (3) identification of novel indicators of health to inform design of a standards-based community health registry for older adults.

Keywords

Smart homes; population health; aging in place; older adults; informatics

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Subsidized laboratory testing as an incentive for improved livestock disease reporting

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Objective

To evaluate free diagnostic testing as an incentive for compliance with a livestock disease surveillance program.

Introduction

Livestock owners normally pay the full cost of disease testing. As a result the number of laboratory submissions is dependent on the owner's perception that testing is beneficial. This decreases the likelihood of an accurate diagnosis and biases the number and type of samples received by a laboratory. Despite these limitations, laboratory data are commonly used for passive disease surveillance.

The Ontario Farm-call Surveillance Project (OFSP) analyzed disease-related farm call data supplied by livestock veterinarians. Project goals were to provide a new data source for livestock disease monitoring and to improve the quality of laboratory data. As an incentive for participation, veterinarians were not charged when diagnostic samples were sent to the Animal Health Laboratory (AHL), University of Guelph.

Methods

The OFSP veterinary clinics were a convenience sample of food-production and equine clinics in Ontario. Clinics participating in OFSP were offered two incentives: (1) free diagnostic testing at the AHL and (2) $175.00 per farm call if postmortems (PMs) were performed and farm call data were received within 10 days of the call. The first incentive was offered for the duration of the project; the second was available from October 2010 to June 15, 2011.

The average number of days from farm call completion to data submission was compared pre- and post-PM incentive.

The rate at which a veterinarian submitted samples for diagnostic testing to the AHL was calculated (total number of submissions/total number of farm calls). Only 20/28 OFSP clinics were enrolled in the study pre-PM incentive. A comparison of the number of submissions to the AHL for those clinics pre- and post-PM incentive was performed. Submissions of animals for necropsy or tissue for histology were classified as 'pathology' submissions. The proportion of livestock pathology submissions that were from the OFSP were compared to the total livestock pathology submissions pre- and postcommencement of the PM incentive. AHL reporting rates of livestock zoonotic diseases were compared pre- and post-commencement of the OFSP (total number of positive livestock zoonotic disease laboratory submissions/total number of livestock laboratory submissions).

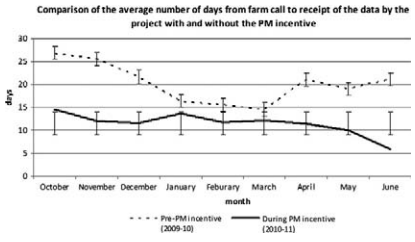

Fig. 1. A comparison of the timeliness of data before and after the start of the Post Mortem Incentive.

Results

One hundred and eight veterinarians from 28 livestock clinics contributed data to the surveillance project between April 2009 and June 2011. No clinics withdrew from the study.

Fig. 1 illustrates the timeliness of reporting before and after the PM incentive.

Veterinarians participating in OFSP submitted a sample to the AHL 11% of the time they completed a disease-related farm call. A comparison of 20 OFSP clinics revealed that 458 more cases were submitted to the AHL while those clinics were participating in the OFSP than the year prior to participation. OFSP clinics represented 19% (28/147) of the clinics submitting pathology samples during the time period the PM incentive was offered. OFSP pathology submissions represented 36% (712/1984) of the total pathology livestock submissions for the same time period. For the same period, the previous year (pre-PM incentive) OFSP pathology submissions accounted for 7.7% (141/1822) of the total pathology submissions.

The proportion of laboratory submissions from OFSP clinics positive for a zoonotic disease increased from 4.3% prior to participation in the project to 7.7% while part of the OFSP.

Conclusions

Incentives are needed to ensure adequate compliance with a surveillance program. The OFSP incentives were considered a key factor in the number of veterinarians participating in the study as well as the 0% drop out rate.

Receiving data quickly is critical when monitoring for new or emerging diseases. Animals found dead or moribund are an important group to monitor for livestock disease surveillance but producers often do not want to pay the cost of a PM. The ability to provide better client service made the incentives offered by OFSP appealing to veterinarians.

The OFSP incentives increased submissions to the laboratory, improved the laboratory data for passive surveillance and, specifically, increased zoonotic disease reporting.

Keywords

Incentives; surveillance; livestock

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