

Addressing Fire Safety As Part of a Home Preparedness Intervention for Families With Children and Youth With Special Health Care Needs

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Introduction: Families with children and youth with special health care needs (CYSHCN) are at disproportionate risk of harm during emergencies, including house fires. In this study, which was conducted as part of a larger project to evaluate a virtual home preparedness intervention (VHPI), our objectives were to explore the fire-safety needs of diverse families with CYSHCN and to assess quantitative metrics of household fire safety before and after the VHPI.

Methods: Approval for this study was obtained from the Drexel University College of Medicine Institutional Review Board (protocol no. 2305009880). Family caregivers of CYSHCN with technology reliance, physical mobility needs, communication/intellectual challenges, and/or vision/hearing loss were recruited from medical homes in Pennsylvania, using purposive sampling to include families living in rural settings or with non-English language preferences. The VHPI was developed by an interdisciplinary research team with input from family caregivers of CYSHCN and comprised pre/post interviews, emergency planning resources a gift card, and as-needed individual referrals to providers in the medical home or community partners. Descriptive statistics were used to explore the sociodemographic characteristics of the respondents. To assess the needs of the study sample and the potential effects of the VHPI on fire safety, the team compared pre/post rates of affirmed tasks on 14 interview items.

Results: The pre- and post-VHPI interviews were completed by 170 and 148 participants, respectively; sociodemographic characteristics are summarized in Table 1. Pre-VHPI, most participants had smoke alarms in their home (98%), although fewer than half tested these alarms monthly (48%). Most also had fire extinguishers (73%) and walking paths in the home that were always free of obstructions (91%). Post-VHPI, nearly 60% affirmed to testing smoke alarms monthly ($p = 0.08$), and the rates of having fire extinguishers in the home and keeping walking paths clear improved significantly (both, $p < 0.05$) (Table 2). Few of the participants with children with hearing loss (HL) ($n = 30$) had light-up smoke alarms (13%) or bed-shaker alarms (3%). Referral of these families to community partners resulted in 84% having light-up alarms and 86% having bed-shaker alarms installed by the completion of the study.

Conclusion: Pre-intervention levels of fire safety were relatively high in this sample of families with CYSHCN. The VHPI yielded some significantly improved fire safety metrics sample-wide and facilitated specific unmet needs to be addressed in families of children with HL.

Incorporating the VHPI into care visits in the medical home may help providers identify and meet the unique fire safety needs of families with CYSHCN.

Table 1. Sociodemographic characteristics of the study sample

Characteristic	No. of Participants (%)
Total no. of participants^a	170 (100)
Caregiver-specific items	
Relationship to CYSHCN	
Mother	139 (81.8)
Father	7 (4.1)
Grandmother	6 (3.5)
Foster parent	9 (5.3)
Adoptive Mom	4 (2.4)
Self	1 (0.6)
Other ^b	4 (2.4)
Self-reported race of primary caregiver	
White	68 (40.0)
Black or African American	58 (34.1)
Asian	5 (2.9)
American Indian or Alaskan Native	1 (0.6)
Other ^c	38 (22.4)
Self-reported ethnicity of primary caregiver	
Not Hispanic or Latino	105 (61.8)
Hispanic or Latino	65 (38.2)
Preferred language of primary caregiver^d	
English	144 (84.7)
Spanish	24 (14.1)
Haitian-Creole	1 (0.6)
Brazilian Portuguese	1 (0.6)
Employment status of primary caregiver	
Not employed	89 (52.4)
Employed full-time	49 (28.8)
Employed part-time	29 (17.1)
Multiple employment	3 (1.8)
Highest level of education completed by primary caregiver	
Middle school	17 (10.0)
High school/GED	70 (41.2)
Some college	31 (18.2)
Associate's degree/technical school	22 (12.9)
Bachelor's degree	12 (7.1)
Master's degree	14 (8.2)
Professional degree (MD, JD, PhD)	1 (0.6)
Other ^e	3 (1.8)

CYSHCN-specific items	
Mean age (SD) of CYSHCN, years	8.5 (6.6)
Median age (range) of CYSHCN, years	7.0 (0 – 26)
Gender of CYSHCN	
Male	105 (61.8)
Female	65 (38.2)
Other	0 (0)
Participant-reported race of CYSHCN	
Black or African American	63 (37.1)
White	62 (36.5)
Asian	5 (2.9)
Other ^c	40 (23.5)
Participant-reported ethnicity of CYSHCN	
Not Hispanic or Latino	92 (54.1)
Hispanic or Latino	78 (45.9)
CYSHCN's diagnostic category^f	
Intellectual/cognitive challenges	135 (79.4)
Reliance on medical equipment/utility	115 (67.6)
Physical mobility need	82 (48.2)
Vision/hearing loss	62 (36.5)
CYSHCN's no. of diagnostic categories^f	
1	50 (29.4)
2	46 (27.1)
3	44 (25.9)
4	30 (17.6)
Household-specific items	
Household income (annual, pretax)	
Less than \$15,000/year	32 (18.8)
\$15,000-24,999/year	20 (11.8)
\$25,000-34,999/year	19 (11.2)
\$35,000-49,999/year	22 (12.9)
\$50,000-74,999/year	12 (7.1)
\$75,000-\$99,999/year	6 (3.5)
\$100,000-149,999/year	2 (1.2)
\$150,000-199,999/year	1 (0.6)
Prefer not to answer	11 (6.5)
Unknown	45 (26.5)
Homeownership status	
Caregiver owns home, pays mortgage	62 (36.5)
Caregiver rents home	101 (59.4)

Other	7 (4.1)
Other children residing in the household	
Yes	115 (67.6)
No	55 (32.4)
Other adults residing in the household	
Yes	103 (60.6)
No	67 (39.4)
Geographic area of residence^g	
Urban	151 (88.8)
Rural	19 (11.2)
Other individual(s) in the home with disability/functional need	
No	98 (57.6)
Yes	72 (42.4)

^aThe total sample of 170 included all individuals who participated in at least the first VHPI visit.

^bMother and father (n = 2), legal guardian (n = 1), grandfather's spouse (n = 1).

^cParticipants were asked to self-identify their and their CYSHCN's race by selecting from predetermined race categories or by specifying "Other." Participants self-reporting as "Other" race identified as Hispanic (n = 29), Puerto Rican (n = 2), Greek (n = 1), 1.5 Italian/1.5 AA (n = 1), prefer not to answer (n = 2), both Black or African American and American Indian or Alaskan Native (n = 1), White and Brazilian (n = 1), unspecified (n = 1), and Black and American descendant of slaves (n = 1). Caregivers reported their CYSHCN's race as Hispanic (n = 29), Greek (n = 1), Puerto Rican (n = 1), Puerto Rican and Peruvian (n = 1), prefer not to answer (n = 2), Black and White (n = 1), White and Asian (n = 2), Asian and Hispanic (n = 1), White/Black (Brazilian) (n = 1), and Black and American descendant of slaves (n = 1).

^dThe HPI visit was conducted in the caregiver's preferred language, with a certified interpreter as needed.

^eThird grade (n = 1), Bachelor's degree not from US and some nursing school in US (n = 1), LPN (n = 1).

^fDiagnostic categories were assessed by medical record review.

^gUsing the county definition of rurality developed by the Center for Rural Pennsylvania (CRP) and based on population density.

CYSHCN, children and youth with special health care needs; SD, standard deviation

Table 2. Pre/post VHPI interview metrics pertaining to fire safety

Fire Safety Item	Affirmed in Initial Interview (n = 170)		Affirmed in Follow-up Interview (n = 148)		p
	%	n ^a	%	n ^a	
Smoke alarm(s) in home	97.7	166/170	98.7	146/148	0.25
Know the type of smoke alarm(s) in home	96.4	160/166	95.2	139/146	0.63
9-volt battery alarm(s) in home ^b	93.0	147/158	91.2	125/137	0.48
10-volt battery alarm(s) in home ^b	19.5	31/159	22.2	30/135	0.63
Smoke alarm(s) that light up ^c	13.3	4/30	84.0	21/25 ^e	0.15
Bed shaker alarm(s) ^d	3.3	1/30	86.3	19/22 ^e	0.13
Smoke alarm(s) tested once per month	48.5	80/165	57.6	83/144	0.08
Smoke alarm(s) on every floor of the home (including the basement)	82.6	123/149	85.2	115/135	0.58
Fire extinguisher(s) in home	72.8	123/169	79.7	118/148	0.03
Received fire extinguisher training ^f	74.0	91/123	78.8	93/118	0.27
Walking path(s) free of obstruction	91.1	154/169	97.3	14/147	0.01
Family member would have to travel through a room that cannot be unlocked from the inside in the case of an emergency	4.1	7/169	4.8	7/147	0.80
All doors and windows can be opened easily from the inside without any keys or special knowledge to open	89.4	152/170	91.2	135/148	0.49
If a key is required, the key is near the door or window easily accessible to all residents ^g	72.7	8/11	75.0	3/4	0.79

^aValue represents no. of participants who answered affirmatively to the question (numerator) vs no. of participants who responded to the question (denominator).

^bQuestion was asked only of participants who affirmed knowledge of the type of smoke alarm in home.

^cQuestion was asked only if participant had a CYSHCN who is deaf/HOH.

^dQuestion was asked only if participant had a CYSHCN who is deaf/HOH or both deaf/HOH and visually impaired.

^eIntervention took place during the COVID-19 pandemic, so health guidelines prevented community partners, such as the American Red Cross, from entering participants' homes to install certain resources during data collection, leading to a longer than average follow-up time for this item.

^fQuestion was only asked of participants who affirmed to having a fire extinguisher in the home.

^gQuestion was asked only of participants who indicated “no” to the preceding question (“All doors and windows can be opened easily from the inside without any keys or special knowledge to open”).