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Major article

Carbapenem-resistant Enterobacteriaceae carriers in acute care hospitals and postacute-care facilities: The effect of organizational culture on staff attitudes, knowledge, practices, and infection acquisition rates

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Background: Carbapenem-resistant Enterobacteriaceae (CRE) carriers are frequently transferred between acute care hospitals (ACHs) and postacute-care facilities (PACFs). Compliance of health care workers with infection prevention guidelines in both care settings may be influenced by the institution's organizational culture.

Objectives: To assess the association between organizational culture and health care workers' attitudes, knowledge, practices, and CRE acquisition rate and to identify differences between different care settings and health care workers' sectors.

Methods: Cross-sectional descriptive design. Self-administered questionnaires were distributed to a sample of 420 health care workers from 1 ACH and 1 PACF belonging to the same health maintenance organization located in central Israel.

Results: The organizational culture factor known as staff engagement was positively correlated with infection prevention attitudes and compliance with contact precaution protocols and negatively correlated with CRE acquisition rate. In the 2 care settings, health care workers' attitudes, knowledge, and practices were found to be similar, but CRE acquisition rate was lower in PACFs. Compliance with contact precaution protocols by physicians was lower than compliance reported by other health care workers. Auxiliary staff reported lower knowledge.

Conclusions: In a setting of endemic CRE where a multifaceted intervention is already being implemented, organizational culture variables can predict health care workers' attitudes, knowledge, and practices and in turn can affect CRE acquisition rates.

Carbapenem-resistant Enterobacteriaceae (CRE), uncommon before 2001, has now spread widely throughout the United States and around the world.[1,2] Israel has effectively employed a nationwide coordinated control effort since a nationwide outbreak of CRE was recognized during 2007.[2] In brief, the intervention includes active surveillance for carriers, implementation of contact precaution protocols, cohorting of carriers and health care workers, and regular mandatory census reporting to the National Center. The intervention in postacute care facilities (PACFs) was launched in 2009 and includes similar components,

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but without staff cohorting.[3] Both interventions have reduced substantially the CRE incidence and prevalence in acute care hospitals (ACHs) and in PACFs.[2-4] CRE reservoir mostly resides in long-term care facilities where prevalence rates may reach 10 times more those of ACHs.[5]

It has been shown for CRE cross-transmission that high compliance with guidelines is correlated with decreased incidence.[2,4,6] Variations in compliance with guidelines may be explained by differences in organizational culture (OC). OC is defined as the assumptions, values, and norms shared among colleagues.[7] OC consists of effective leadership, the nature of the working environment, and the extent and quality of staff–management cooperation.[7] Sinkowitz-Cochran et al[8] investigated the associations between OC and staff knowledge, attitudes, and practices in a project to prevent methicillin-resistant *Staphylococcus aureus* (MRSA) infection. They found that staff engagement and hospital leadership (both key components of OC) were significantly correlated with higher knowledge levels, higher levels of reported compliance with hand hygiene, fewer reported barriers to hand hygiene practice, and with a more positive attitude by staff to MRSA infection prevention.

Because ACHs and PACFs are different per definitions with respect to case mix, length of stay, intensity of care provided, and other patient-related risks for cross-transmission, we aimed to examine an association between OC and health care workers' attitudes, knowledge, practices, and CRE acquisition rate in an ACH and a PACF providing care for the same population during different stages of illness.

MATERIALS AND METHODS

Research design and sample

A cross-sectional descriptive design was used. Questionnaires were distributed to a sample of 420 health care workers at 1 ACH and 1 PACF. Two hundred sixty-eight returned a completed questionnaire (response rate, 64%). The following health care professions were represented in the study: registered/academic nurses, practical nurses/auxiliary staff, physicians, and paramedical staff (eg, radiology technicians and physiotherapists). Employees with <12 months on the job and students were excluded from the sample.

Settings

Two health care facilities located in a single administrative area in central Israel belonging to the same health care maintenance organization (Clalit Health Services, the major health care maintenance organization in Israel, maintains 14 general and special hospitals spread throughout the country). Both facilities comply with CRE national guidelines regarding admission screening, contact isolation, cohorting of carriers, and cohorting of staff (ACH only). Both facilities follow the national guidelines for hand hygiene in health care facilities, which are based on the World Health Organization approach. The ACH is a 241-bed community hospital that serves a population of about 250,000. Questionnaires were distributed to health care workers in 3 internal medicine wards, 3 surgical wards, a general intensive care unit, an emergency medicine department, and a hemodialysis unit. The PACF is 268-bed facility that serves a population of about 600,000. Questionnaires were distributed to health care workers in the skilled nursing care ward, rehabilitation ward, and 2 chronic mechanically ventilated patient wards.

Procedure

After approval by the ethics committee of both care settings, questionnaires were distributed from January-February 2013. CRE acquisition rates in the ACH and PACF from January-December 2013 were received from the Israeli National Infection Prevention Center (personal communication, April 1, 2014). The correlation between OC and CRE acquisition rate was examined in ACH at 3 comparable internal medicine wards.

The questionnaire

We used the tool developed by Sinkowitz-Cochran et al.[8] The questionnaire distributed was written in Hebrew, was designed to be self-administered, and took 15 minutes to complete. The original questionnaire was validated by its developers and the Hebrew-language version we used was validated by the method of back translation.

Demographic data included

The demographic data collected include the respondent's health care profession (eg, nurse, physician, or auxiliary and paramedical staff), workplace, and department.

OC factors examined

Staff engagement, overwhelmed/stress-chaos, and hospital leadership were the OC factors that were examined. This section comprised 22 statements about which respondents were asked to rate their agreement on a 5-point Likert scale, from 1 = strongly disagree to 5 = strongly agree. The Cronbach's alpha scores for internal reliability were for staff engagement, 0.92; for overwhelmed/stress-chaos, 0.87; and for hospital leadership, 0.87 (Supplementary data). Health care workers' knowledge, attitudes, and practices regarding CRE prevention was tested as follows.

Knowledge. A statement about the most common way of CRE transmission was deleted because all respondents answered correctly.

Attitude

This section originally comprised 11 statements but factor analysis found 7 items on negative attitudes had low internal reliability and they were deleted, leaving 4 items only on positive attitudes: "When colleagues do not wear gown and gloves/do not clean their hands, before caring for a CRE carrier I feel free to remind them," "If I wear gloves and a gown/clean my hands as recommended, I will decrease my patients' risk of getting CRE." With these items respondents were asked to rate their agreement on a 5-point Likert scale, from 1 = I disagree to 5 = I agree, so that the higher the overall score the more positive were the respondent's attitudes to the care of CRE carriers. The Cronbach's alpha score for this section was 0.75.

Practices

Compliance with contact precaution protocols was evaluated. Respondents were asked to rate as a percentage their compliance with wearing gloves and a gown when caring for patients with an order to follow contact precautions. One hundred percent was considered a positive answer.

Obstacles to hand hygiene practice were also determined. After factor analysis the 6 obstacles were grouped into staff-related obstacles (eg, forget, too busy, product smells bad/damages my skin [Cronbach's $\alpha = 0.70$]) and management-related obstacles (eg, alcohol or soap not easy to get to, lack of products [Cronbach's $\alpha = 0.89$]). Based on Cronbach's alpha, the