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## Frontline engagement through social gamification: Reducing healthcare-associated conditions and having fun!

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Hospitals are dangerous. The US healthcare industry wastes over $200 billion dollars annually in failed attempts to optimize care. Medical errors cause over 440,000 deaths. Best Practice Standards are NOT standard practice. Current technological solutions focus on the centuries-old dyad of doctor and patient, neglecting a key gap: Our frontline staff-- nurses, therapists, pharmacists-- who actually deliver care. The frontlines are lost in a system of accelerating complexity and encumbered by traditional professional silos-- with technology more a barrier than an enabler. At UCSF, we are developing a mobile workforce solution to engage frontline staff in generating, learning, and adhering to best practices. Smart incentives, gamified learning and just-in-time tutorials — selected and created by the frontlines to meet their unit's needs— work together to decrease hospital-acquired conditions and increase patient satisfaction. We deployed our prototype in pediatric BMT, Heme-Onc, and ICU, aiming to reduce central line-associated bloodstream infections (CLABSI)-- a costly, dangerous problem at all hospitals, though one addressable by adherence to best practices -- if only staff could be incentivized to rigorously master the standards of care. Motivated by fun, software-based contests with real-world recognition and prizes, nurses engaged. The result: CLABSI was cut by 48%, with an estimated savings of 3 lives, over 300 hospital days, and $1M USD. With continued development and broad adoption, this platform will not only enhance internal outcomes, but can also drive inter-institutional sharing of practice standards and previously siloed internal improvements, elevating healthcare quality worldwide.

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## Increases and decreases in salivary cortisol and alpha-amylase in mothers during infant feeding

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The aims of this study were to test the feasibility of using salivary cortisol and salivary amylase (sAA) as indicators of maternal emotional arousal during feeding of young infants and to examine whether maternal-infant interactional behavior during feeding was associated with increases and decreases in cortisol and sAA. In this descriptive study, saliva was collected from 20 breastfeeding mothers with mean age of 30.5 (SD 6.1) years. Fourteen (58%) mothers were Caucasian. Infants were born at term, and were 7 to 18 days of age when feeding observations were done. For saliva collection, mothers sucked on a dental swab immediately before the feeding, 10 minutes after the feeding began, at the end of feeding, and 20 minutes after the feeding ended. Salivary cortisol is a valid indicator of HPA system function. sAA is an enzyme secreted in saliva that increases in response to activation of the autonomic nervous system, and is a sensitive indicator of psychological stress. The Nursing Child Assessment Feeding Scale was used to assess mother-infant behavior. Mothers reported no feeding disruption or distress during saliva collection. Salivary cortisol significantly decreased from baseline through 20 minutes after the feeding while sAA increased nonsignificantly. Several mother-infant behaviors differed based on whether cortisol or sAA increased or decreased with moderate effect sizes. Only maternal sensitivity to infant cues showed a significant difference in both cortisol and sAA. Levels decreased when mothers showed more sensitive behaviors. Findings suggest that use of physiologic biomarkers may provide insight into mother-infant interaction during feeding.

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Page 72