Letters to the Editor

Parents as a Vector for Nosocomial Infection in the Neonatal Intensive Care Unit

To the Editor:

The frequency of multiple births is increasing.[1] Multiple gestations are more likely to result in premature birth and problems associated with prematurity. This may result in newborn siblings being admitted to the neonatal intensive care unit (NICU) simultaneously. We report two situations where the parent appeared to transfer or be the source of an organism that infected multiple siblings.

Case 1. Siblings A1, A2, and A3 were born by cesarean section at 25 weeks gestation, after the mother developed premature rupture of members for baby A1. Placenta A1 showed evidence of chorioamnionitis, but cultures were negative. Each infant weighed less than 1,000 g. Different nurses cared for each infant in three different rooms of our five-room NICU. Resident and attending physicians were the same for all three infants; however, the physicians could not recall moving directly from one sibling to another.

Baby A2 developed sepsis and died on day 14 of life. *Pseudomonas aeruginosa,* an unusual isolate in our NICU,[2] was grown from premortem blood, postmortem blood, and sputum specimens. The mother held the infant after its death. Infant A1 developed necrotizing enterocolitis on day 19 of life and had positive endotracheal cultures for *P aeruginosa* on the same day. Subsequently, stool cultures were intermittently positive for *P aeruginosa*. In association with necrotizing enterocolitis, the infant developed enterocutaneous fistulae that intermittently drained stool.

Infant A3 had multiple problems due to prematurity but had stabilized before suddenly deteriorating on day 46. This infant died 24 hours later and had postmortem cultures of lung, liver, and spleen positive for *P aeruginosa*. Genomic DNA was analyzed per protocol on a GenePath contour-clamped homogeneous-field apparatus (Bio-Rad, Hercules, CA). Fingerprinting analysis was performed using the GelDoc1000 and Molecular Analyst restriction fragment-length polymorphism software (BioRad, Hercules, CA). The pulsed-field gel electrophoresis fingerprint for all three *Pseudomonas* isolates was identical.

Case 2. Siblings B1, B2, and B3 were born by cesarean section at 29 weeks. On day 29 of life, baby B1 developed *Staphylococcus aureus* bacteremia and expired. On day 52 of life, baby B2 developed *S aureus* conjunctivitis that was treated topically. *S aureus* is an uncommon isolate in our NICU. The father of these infants had a chronic open wound with prior cultures positive for *S aureus.* He visited the children several times a week. Pulsed-field gel electrophoresis typing of the isolates from babies B1 and B2 and the father's wound were identical.[3]

These cases underscore the possibility that parents can transfer organisms from patient to patient or serve as the source of a common-source outbreak in the hospital setting when the patients are siblings. Parents are encouraged to interact with their newborns in most NICUs. In our NICU, care providers and parents perform a 2-minute scrub with antimicrobial soap before entering. Care providers wash their hands after each activity associated with possible contamination of their hands. However, in the past, we did not require parents to wash their hands after contact with an infant. Parents must be instructed and monitored in hand washing between siblings. Alcohol hand rubs may facilitate compliance.[4]

Our findings have implications for other NICU practices. Sharing of items, such as toys, between siblings should be discouraged. Cobedding should be reserved for near-term infants who are not critically ill and who are free of drains, tubes, and colonization or infection with pathogenic organisms.

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The Economic Impact of Influenza in a University Hospital Setting

To the Editor:

Nursing home residents and hospitalized persons are at increased risk of influenza-related complications. Institutional outbreaks likely occur frequently but may not be recognized or reported. Influenza infections among healthcare workers not only result in substantial work absenteeism but also serve as sources of infection for patients, whereas viral shedding is normally reduced in vaccinees.

We wanted to determine the impact of influenza and influenza-like illness (ILI) in hospital employees in the University Hospital of Zurich.

This was a cross-sectional and observational study. We drew a randomized sample of 200 employees from the hospital's telephone registry, covering a total of 5,525 employees. The sampled individuals were contacted by telephone after the 1999/2000 influenza season between February 18 and March 17, 2000, and asked to give information on ILI experienced during the period between November 1, 1999, and the date of the telephone interview (the observation

TABLE
VACCINATION RATES AND ABSENTEEISM AMONG DIFFERENT HEALTHCARE PROFESSIONALS

Function	Employees Vaccinated/ Employees Not Vaccinated	Vaccination Rate, %, CI_{95}*	Total Employees With ILI/Total Employees Without ILI	ILI Attack Rate, %, CI_{95}†	Total ILI With DOW/Total ILI Without DOW	Proportion Absent, %, CI_{95}‡	Mean Days off Work, CI_{95}§
Physicians	4/29	12.1 (1.0-23.2)	8/25	24.2 (9.6-38.8)	6/2	75 (45-100)	2.3 (1.5-3.1)‖
Nurses	6/55	9.8 (2.3-17.3)	21/40	34.2 (22.3-46.1)	18/3	85 (70-100)	5.7 (4.0-7.4)‖
Administration	8/44	15.4 (5.6-25.2)	18/34	34.6 (21.7-47.5)	14/4	78 (59-100)	4.0 (3.1-4.9)
Laboratory	4/14	22.2 (3.0-41.4)	5/13	27.8 (7.1-48.5)	2/3	40 (0-83)	4.0 (2.0-6.0)
Technicians	1/8	11.1 (-9.4-31.6)	1/8	11.1 (-9.4-31.6)	1/0	100 (0)	3.0 (0)
Scientists	2/4	33.3 (-4.4-71.0)	3/3	50.0 (10.0-90.0)	3/0	100 (0)	2.0 (0)
Kitchen	2/5	28.6 (-4.9-62.1)	2/5	28.6 (-5.0-62.1)	2/0	100 (0)	2.0 (0)
Cleaning	2/6	25.0 (-5.0-55.0)	0/8	0 (0)	0/0	0 (0)	0 (0)
Social worker	2/5	28.6 (-5.0-62.2)	1/5	16.7(-13.1-47.0)	1/0	100 (0)	10 (0)
Total	30/170	15 (10.1-19.9)	59/141	29.5 (23.2-35.8)	47/12	80 (69-90)	4.3 (3.5-5.1)

Abbreviations: CI_{95}, 95% confidence interval; DOW, days off work; ILI, influenza-like illness.
* Fisher's Exact Test: chi-square: 7.60, P=.521.
† Fisher's Exact Test: chi-square: 8.05, P=.416.
‡ Fisher's Exact Test: chi-square: 8.76, P=.324.
§ Kruskal Wallis test: P=.011.
‖ Mann Whitney U Test between physicians and nurses: P<.005.

period). Estimates of influenza attack rates were determined on the basis of the mean ratio between reported ILI cases and influenza virus isolates derived from regional sentinel data.[1] The economic impact was determined using the human capital approach using average wages calculated on the basis of the annual report of the University Hospital Zurich. The SPSS statistical package (version 9.0; SPSS, Chicago, IL) was used to perform all the computations.

A total of 59 individuals had at least one ILI within the observation period. This represented a seasonal point prevalence of 29.5% (95% confidence interval [CI_{95}], 23.2-35.8). Four (6.8%) of these employees complained of having had more than one episode.

Healthcare workers with patient contacts were slightly more frequently sick with ILI than those without patient contacts (31% vs 27%, P=.535). Overall, 23 individuals (39%) with an ILI required a physician visit. Only 2 individuals indicated the use of a neuraminidase inhibitor. Overall, it can be estimated that, during the 1999/2000 season, approximately 349 (CI_{95}, 240-477) hospital employees contracted an influenza infection.

Vaccination coverage across the total sample was 15% (CI_{95}, 10.1%-19.9%). Employees with patient contacts were less likely to be vaccinated against influenza (13%; CI_{95}, 7%-20%) than those without patient contacts (17%; CI_{95}, 10%-24%). This association was, however, not statistically significant (P=.287). Vaccination rates differed among the various professional groups (Table), but not significantly.

Among the 30 vaccinated healthcare workers, 7 (23%) experienced an ILI. In comparison, 52 (31%) of the 170 nonvaccinated healthcare workers developed an ILI, suggesting a vaccination effectiveness rate of 25%. On average, employees were off work for a period of 4.3 (CI_{95}, 3.5-5.1) days. Employees with ILI who had a physician visit had more days off work (6.1 days; CI_{95}, 4.6-7.7) than those who did not visit their physician (3.0 days; CI_{95}, 2.4-3.6; P<.0001). There was no association between absenteeism and vaccine coverage rates. The mean number of days off work differed significantly between the various professional groups, with the nursing staff showing the most days off work, significantly more than physicians (P<.005). Among vaccinated individuals absenteeism rates were 17%; in unvaccinated individuals, 25% (odds ratio [OR], 0.6; CI_{95}, 0. 2-1.7).

On the basis of the results obtained, it is possible to estimate the overall economic impact on the University Hospital Zurich. Based on an average 4.3 days off work in employees with an ILI and an attack rate of 29.5%, the total number of absenteeism days may be in the neighborhood of 5,606 days. By multiplying the lower and upper CI_{95} limits of the number of days off work per ILI with the lower and upper CI_{95} of the ILI attack rate, we find that the likely overall number of lost working days in each season falls between 3,096 and 9,079 days. The corresponding estimates for influenza infection are between 646 and 1,943 days. The economic consequences of this productivity loss may thus equal approximately 1.2 million Swiss Francs (SFr; $750,000) for ILI and 289,000 SFr ($180,625) for influenza infections, representing 0.3% and 0.08% respectively, of the overall annual personnel expenditure of the hospital. The ranges of these estimates are between 0.68-2.0 million SFr ($0.42-$1.2 million) for ILI and 164,000-480,000 SFr ($102,500-$300,000) for influenza infections.

This study has shown that ILI and influenza among healthcare workers are not only clinically relevant but also pose a great burden to the overall hospital budget. Productivity losses for influenza are immense and represent between 0.05% and 0.1% of the overall expenditure for personnel. This burden could easily be reduced by appropriate preventive measures, foremost of which is influenza vaccination. Unfortunately, vaccination coverage

rates were very low in our setting as compared to other recently available studies.[2,3] This is particularly troublesome due to the potential impact of nosocomial influenza infections among high-risk hospitalized patients. Thus, our figures might even be conservative in this respect. However, we could confirm higher coverage rates in physicians, technicians, and laboratory workers.[3]

The use of rapid influenza diagnostic tests can help to identify influenza outbreaks early and can allow earlier initiation of infection control measures to reduce influenza transmission. Influenza control measures include cohorting ill patients, instituting Droplet Precautions, using antiviral medications for influenza prophylaxis and treatment, and re-offering influenza vaccine to unvaccinated patients and healthcare workers.[4] Although antiviral medications are an important adjunct for influenza prevention and control, particularly in healthcare settings, vaccination remains the primary means of preventing influenza and its complications.

Several studies have demonstrated that influenza vaccination is cost-effective in healthy working adults[2] and very effective in healthcare workers.[5] In the future, economic benefits should be assessed for every individual organization or company, taking into account all individual criteria. Using this, employers can judge for themselves whether they offer a flu shot to their employees or not. Because most European healthcare systems are financed directly or indirectly on the basis of paid labor income, a positive effect of influenza vaccination on productivity also will be highly important on a societal level. Thus, the offering of cost-effective healthcare solutions on the level of employers is not only ethical but also an act of good citizenship.

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Nosocomial *Mycobacterium chelonae* Infection in Laparoscopic Surgery

To the Editor:

Minimally invasive laparoscopic surgery offers the advantages of early postoperative recovery with decreased infection and less morbidity. The overall infection rate is at par with conventional surgery. We report a series of 33 patients who underwent laparoscopic surgery (6 diagnostic and 27 operative) over an 8-week period at our hospital, a tertiary-care center in central Mumbai. The operative group included 11 cholecystecomies and 16 gynecological procedures, including 5 lyses of adhesions, 5 cystectomies, 3 tubal ligations, 2 laparoscopic-assisted vaginal hysterectomies, and 1 myomectomy. The duration of procedures ranged from 30 minutes to 6 hours.

All patients did well in the immediate postoperative period. However, subsequently, 16 patients had symptoms of pain, hyperemia, induration, and discharge at the operative site 3 to 4 weeks after surgery. There were no systemic symptoms such as fever, weight loss, or malaise.

Ziehl-Neelson stain, routinely performed on all pus samples in our laboratory, revealed acid-fast organisms in the wound discharge from all these patients; 13 of these were culture-positive for *Mycobacterium chelonae*, identified by rapid growth in 3 days, catalase- and aryl sulphatase-positivity, growth on MacConkey's medium and niacin, nitrate reduction, and lack of iron uptake. The organisms were resistant to the standard antitubercular drugs but were found to be sensitive in vitro to amikacin, clarithromycin, imipenem, and ciprofloxacin.

Despite appropriate antimicrobial therapy for 2 to 4 weeks, 11 of the 16 patients required debridement and wide excision of the tract. Surgical exploration revealed multiple tracts with pearly white gelatinous areas of caseation. Histopathological examination confirmed necrotizing granulomas with epitheloid cells and giant cells, consistent with a diagnosis of tuberculosis (TB). Three patients required secondary excision; however, all patients recovered fully within 6 months.

This outbreak prompted an active search for the point source in the laparoscope. *M chelonae* was isolated from a rubber diaphragm in one of the cannulae. In this epidemic, we found that merely soaking the trocars or cannulae in 2% glutaraldehyde without completely dismantling the parts was not adequate. The hospital water supply was screened, but we could not isolate any rapidly growing mycobacteria at the time.

Rapidly growing mycobacteria are an increasingly important group of human pathogens. Their rise in clinical significance relates to a greater awareness of these organisms as pathogens.[1-3] They usually are isolated from tap water, and infection of the skin and soft tissues is most common. In a country such as ours, where TB is endemic, it is imperative to isolate and identify these organisms to prevent needless therapy with antitubercular drugs. To compound matters, as healing of these wounds is protracted, these patients could inadvertently be misdiagnosed as multidrug-resistant TB if culture with susceptibility is not performed at the outset.

With the advent of newer technologies, it is essential from an infection control perspective to ensure that proper disinfection of equipment be performed. As a corrective measure at our institute, we have two dedicated persons whose sole job is handling the disinfection of laparoscopes. This entails flushing with a water-jet device immediately after use, treatment with proteolytic enzymatic detergents to dissolve clots, etc, and complete dismantling of all parts before disinfection with 2% glutaraldehyde. Lastly, ethylene oxide sterilization of nonmetallic parts and autoclaving of all metallic parts is undertaken.