

BEFORE THE
SURFACE TRANSPORTATION BOARD

FINANCE DOCKET NO. 33407

DAKOTA, MINNESOTA & EASTERN RAILROAD CORPORATION
CONSTRUCTION INTO THE POWDER RIVER BASIN



ENTERED
Office of Proceedings

JUN 6 2005

Part of
Public Record

COMMENTS OF
MAYO FOUNDATION
ON THE
DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

Keith G. O'Brien
Rea, Cross & Auchincloss
1707 L Street, N.W.
Suite 570
Washington, DC 20036

Attorney for Mayo Foundation

Dated: June 6, 2005

ORIGINAL

BEFORE THE
SURFACE TRANSPORTATION BOARD

FINANCE DOCKET NO. 33407

DAKOTA, MINNESOTA & EASTERN RAILROAD CORPORATION
CONSTRUCTION INTO THE POWDER RIVER BASIN

COMMENTS OF
MAYO FOUNDATION
ON THE
DRAFT SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

In accordance with the schedule published by the Surface Transportation Board (STB or Board), Mayo Foundation (Mayo) hereby submits its comments on the Draft Supplemental Environmental Impact Statement (DSEIS) served on April 15, 2005. Mayo's comments will focus primarily on the remanded horn noise issue.

The Section of Environmental Analysis (SEA) prepared and issued the DSEIS in response to the remand of the 8th Circuit Court of Appeals in Mid States Coalition for Progress v. STB, 345 F.3d 520. As pertinent to the horn noise issue, the Court found the Board erred in failing to consider other types of mitigation not involving limiting the use of horns.¹ The Court observed such other mitigation measures might include, for example, sound-insulating treatments for buildings within high noise areas and installation of sound barriers.

¹ The Court indicated that the Board could appropriately defer to the Federal Railroad Administration in refusing to limit the sounding of locomotive horns. In this regard, the DSEIS points to FRA's Interim final Rules effective December 18, 2004, establishing requirements for locomotive horn soundings at grade crossings.

In remanding this issue, the court expressed serious concerns that horn noise will “increase the distance at which buildings will be subjected to average noise levels of 70 decibels from 210 feet (distance of effect of wayside noise alone) to 1110 feet.” The Court observed that it is “hard to imagine how insulating affected buildings might pose a safety threat” and directed that the Board must at least explain why such mitigation is not warranted. 343 F.3d at 536.

The Adverse Impact of Horn Noise

The adverse impact of noise on patient rehabilitation and sleep requirements is not in dispute. Previously in a response to the DEIS, Mayo cited testimony of David Bishop who represented a part of Rochester in the State House of Representatives for 10 years (Mayo Comments, p. 42) and Dr. Peter Amadio of the Zumbro Valley Medical Society (Mayo Comments, p. 44) addressing the effects of noise on patient care. Attached is a copy of a study conducted in 2004 by Mayo nursing staff, which clearly defines the deleterious effects of sleep disturbance on patients because of noise disruptions.

The severity of the potential impact of persistent noise on recovering patients is graphically illustrated in the attached article that appeared in the June 2, 2005, issue of the Washington Examiner. In this instance, the Alexandria Virginia Police Department stepped in to remove an automobile with a malfunctioning alarm that caused three days of annoyance and serious sleep disruption to a woman endeavoring to recover from recent surgery. Unfortunately, Mayo patients would not have recourse to the Rochester Police Department to tow away DM&E trains blowing horns in close proximity to their bedsides. Mayo reemphasizes its alarm as to the prospective impact on its patients who

will be subjected to train whistles throughout the day and night if adequate mitigation or preventive measures are not forthcoming.

The FRA's New Regulations Will Increase The Adverse Impact Of Horn Noise

On Mayo Patients

Mayo previously expressed its concerns over the proposed FRA regulations mandating the sounding of locomotive horns at highway rail crossings. Absent considerable investment of public funds that would be required to substantially upgrade grade crossings in close proximity to Mayo facilities and throughout Rochester and approval of a whistle free zone by the Federal Railroad Administration, new FRA regulations mandating sounding of locomotive horns at highway rail crossings will result in virtually uninterrupted sounding of locomotive horns from one end of Rochester to the other at all hours of the day. Mayo has reviewed and supports comments made by Olmsted County and the City of Rochester regarding the proximity of crossings within the City of Rochester and the impact of horn noise.

SEA's comments concerning availability of whistle free zones upon satisfaction of FRA requirements are not responsive to the Court's remand. However it should be recognized that installation and maintenance of four quadrant lights and gates at the thirteen motor vehicle grade crossings in Rochester would be very costly and there is no assurance as to the availability of assistance funds to meet those requirements.² Thus, Rochester and its constituents would be faced with the daunting task of seeking access to

² It should be noted that the first of the two grade separations mandated in the Board's previous order would not be required until traffic levels through Rochester reach 20 million tons of coal and the second not until traffic levels reach 50 million tons of coal annually. Those volume levels might never be reached depending upon the volume of PRB coal related traffic actually moved through Rochester. Thus any immediate hope for a quiet zone in Rochester would require gates and lights at all crossings within the community.

scarce public funds from the federal or state government or most likely undertaking the burden within the impacted community in order to secure adequate relief.

Moreover, Mayo reiterates its previously expressed concerns that the FRA requirements for whistle-free zones would exacerbate other problems including increased delays for emergency and other vehicles at grade crossings.

The SEA must fully evaluate this potential impact. Specifically, the SEA must accurately describe in the SEIS the duration of horn noise through the City of Rochester and its impact on sensitive receptors.

Possible Measures of Mitigation

With respect to possible measures to mitigate horn noise, SEA considered requirements for sound proofing material on buildings such as additional insulation, newer insulated windows or air conditioning so that windows would not have to be opened. However, thus far SEA has declined to recommend any of these measures for the following several reasons:

- First, this type of mitigation would constitute a departure from precedent in other cases where such measures were imposed only for wayside noise, not horn noise.
- Second, many horn noise receptors will also benefit from the mitigation previously imposed for wayside noise.
- Third, DM&E may not reach the full operational level for several years if at all. Further, due to several alternative interchange locations along DM&E's system, the City of Rochester and Mayo's facilities might never experience the full level of 37 trains per day and the associated noise.

- Fourth, the grade crossing improvements will alleviate horn noise to some extent.
- Fifth, horn noise mitigation at the noise receptors themselves would be extremely costly – ranging from \$4.3 million to \$17.4 million in the five communities (out of 56) that have not negotiated agreements with DM&E.³
- Finally, requiring mitigation in these communities might cause the other communities to opt out of their negotiated agreements.

Mayo supports and agrees with comments submitted by Olmsted County and the City of Rochester regarding unresponsiveness, inaccuracy, and insufficient analysis demonstrated by the reasons cited by the SEA for declining to recommend any of these measures.

Furthermore, the SEA must re-evaluate the cost of mitigation by looking at a partial solution focusing on the most sensitive receptors, e.g., highly sensitive clinic and hospital facilities, retirement living centers, nursing homes and assisted living facilities. In Rochester highly sensitive facilities located within 1,110 feet of the DM&E main line (the area of impact at the 70dBA Ldn noise level) include Rochester Methodist Hospital with 794 licensed beds, Mayo Clinic Rochester (a medical group practice involving over 1600 physicians), the Federal Medical Center, Hope Lodge (a 28 unit hospice facility), Charter House (a retirement living center with more than 230 independent living units, a 32-bed Medicare certified skilled nursing facility, a 32-bed Supportive Care Center and a 45 unit residential Assisted Living Center), Central Towers (a 105 unit senior retirement

³ These estimates are based on cost-per-receptor ranging from \$1,000 to \$4,000. The particular type of sound-proofing is not identified by type or location.

living center) and Park Towers (a 180 unit senior retirement living center). Even though the SEA may ultimately conclude that it would be too costly to mitigate for all sensitive receptors, it should at least provide an analysis of the impact on, and consider recommending mitigation for, these highly sensitive populations.

The fact that smaller communities with concerns different in size and scope than those faced by Mayo and Rochester have entered into agreements with DM&E, should not be deemed as an excuse to alter or diminish the responsibility of SEA to evaluate the unique circumstances in Rochester and to reconsider in good conscience mitigation deemed warranted and sufficient to address the serious impact from horn noise to the detriment of recovering patients and to the peace and tranquility that should be assured for residents at hospice and assisted living facilities. "NEPA does not require a fully developed plan that will mitigate all environmental harm before an agency can act..." (Laguna Greenbelt v. United States Department of Transportation, 42 D.3d 517 (9th Cir. 1994).

This is the largest construction case ever reviewed by the Board and consequently it has unique ramifications including the prospective impact of 37 or more trains blowing whistles through Rochester and rumbling in close proximity to Mayo facilities where patients from around the world are depending upon a constructive environment conducive to healing. What the Board may or may not have done in other circumstances not involving such widespread critical health concerns should not preclude SEA from recommending measures adequate to ensure that the healthy environment maintained by Mayo and Rochester is not seriously degraded to the detriment of all concerned.

SEA also investigated the construction of sound walls along portions of the existing line bordered by residential areas and other sensitive receptors. Relying on cost information previously submitted by the City of Rochester, SEA estimated that it would cost \$5.8 million to erect sound walls in Rochester alone and another \$4.8 million in other communities that do not have negotiated agreements.

Beyond the cost issue, SEA opines sound walls are not effective, are unattractive, require maintenance, attract graffiti, create safety hazards for persons and animals caught between road crossings, and create visual obstructions. SEA also repeats its concern that implementation of sound barrier mitigation could undermine negotiated agreements already in place.

In view of the effectiveness of sound barriers on interstate roadways within city environments such as I-66 within the Washington DC area, SEA's dismissal of careful inquiry into possible use of such barriers as a protection for Mayo and other sensitive receptors is not justifiable. SEA should thoroughly evaluate such alternatives before making a final recommendation in a SEIS for consideration by the Board.

SEA Has Failed To Address the Most Effective Alternative

Notwithstanding the cavalier and inadequate analysis of mitigation for horn noise as remanded by the Court, more importantly, SEA has not addressed a readily apparent and compelling alternative that would serve to mitigate, indeed eliminate, the adverse impact on Mayo and its patients that would result from train horns blowing incessantly throughout Rochester as mile long trains speed by in close proximity to Mayo facilities.

At page 2-10 of the SDEIS, SEA reasons that "some communities especially those further east, might never experience the full level of 37 trains per day and

associated levels of noise including horn noise” because “several alternative interchange locations along DM&E’s existing system would allow interchange of coal traffic with other carriers.” This statement is a rudimentary recognition of an important alternative that has not been rigorously explored and objectively evaluated as required by NEPA⁴.

The Board’s previous decision in which it considered the nature and extent of the environmental issues involved with the proposed construction project was served on January 30, 2002. Not four weeks later on February 26, 2002, Iowa, Chicago & Eastern Railroad Corporation (IC&E), a non-carrier subsidiary of Cedar American Rail Holdings which in turn is wholly owned by DM&E, posted notice to employees of I&M Rail Link, LLC (IMRL) of its intent to acquire and operate the rail lines of IMRL. Thereafter, on June 7, 2002, IC&E filed notice of exemption to acquire and operate the assets of IMRL including (1) IMRL’s existing rail lines that extend about 1,125 miles between Chicago, IL, Kansas City, MO and Minneapolis – St. Paul, MN; and across northern Iowa and southern Minnesota and (2) 275 miles of IMRL trackage rights over other carriers and other interests.

In Iowa, Chicago & Eastern Railroad Construction – Acquisition and Operation Exemption – Lines of I&M Rail Link, LLC, STB Finance Docket No. 34177, served July 22, 2002, the Board denied a request to stay effectiveness of the acquisition of IMRL. In that Decision, the Board noted that it received comments from the U.S. Department of Transportation (DOT) urging the Board to expand environmental oversight in the DM&E construction case to encompass communities on IMRL lines (July 2002 Decision, p. 5)

In the July 2002 Decision, the Board acknowledges “it is possible that construction and operation of [DM&E’s proposed] new line could result in substantial

⁴ 40 C.F.R. 1502.14

additional traffic on what are now IMRL lines as a result of this transaction” (Decision, p. 15). The Board then notes “[W]e did not address the proposed acquisition in our EIS in DM&E Construction, however, as the proposed acquisition transaction was not announced until after we had given approval for that line to be constructed” (July 2002 Decision, p. 18, note 29). The Board did preclude IC&E from moving any additional trains handling traffic to and from the line approved for new construction in DM&E Construction over what was IMRL lines until an environmental review is conducted (Decision, p. 19).

Subsequently on August 29, 2002, DM&E and Cedar American Rail Holdings filed an application seeking acquisition of control of IC&E (formerly IMRL) in STB Finance Docket No. 34178. A key objective cited in that application was that common control “will guarantee that DM&E will have neutral eastern routings for coal movements from the Powder River Basin (PRB) in Wyoming if and when DM&E constructs that line” (STB Finance Docket No. 34178, served February 3, 2003, p. 8).

In his verified statement in support of DM&E’s proposed acquisition of control of IC&E (IMRL), Mr. Kevin Schieffer, President of DM&E stated:

1. DM&E previously negotiated for access, trackage rights and marketing arrangements with IMRL but was unsuccessful in acquisition talks in late 1999 and early 2000 (VS, p. 2).
2. Critical to the proposed combination is availability of efficient interchange at Owatonna (VS, p5)
3. The proposed common control will protect and ensure competitive and marketing benefits to be derived from the PRB project. (VS, p.6).

4. The importance of IMRL was identified in the DM&E PRB application as IMRL has always been an important connection for the PRB project. (VS, p.7,8).
5. The original modeling done on the PRB project contemplated an agreed upon power of attorney for DM&E to quote rates over the IMRL and trackage rights that would have allowed DM&E to run on IMRL tracks.⁵ Any additional control provided by ownership or common control would not naturally change the degree of flexibility and marketing authority DM&E initially assumed relative to the PRB project on initial planning as set forth before the STB (IMRL was not a party in the Construction Proceeding). (VS, p. 8).

The Department of Transportation filed comments in the control proceeding in which it recognized that once DM&E and ICE come under common control the reason for not considering cumulative environmental impacts of routing PRB coal over IC&E lines in the PRB Construction Case (that is, the asserted lack of authority to require DM&E to take action on property it does not own) “will not longer be valid (because with common control, DM&E will effectively “own” the IC&E lines).⁶

By decision served on February 3, 2003, the Board approved control by DM&E of IC&E. Thereafter the 8th Circuit vacated and remanded the Board’s decision in the Construction case in Mid States. As a result, the Construction Case is not final and

⁵ (Acquisition of IMRL trackage rights would have required Board review and approval pursuant to 49 U.S.C. 11323-11326. No request for such rights was submitted in connection with Construction Application).

⁶ See, Decision No. 7 STB No. FD 34178, Appendix B, p. 37.

obviously, DM&E does not possess the requisite authority to construct and operate its proposed new line.⁷

In view of the fully disclosed interrelationship of the construction application and acquisition of control of the former IMRL by DM&E and the potential for mitigating, or avoiding entirely, the serious adverse impacts on Mayo and Rochester routing of PRB coal traffic over former IMRL lines is a compelling alternative that must now be thoroughly considered and fully evaluated.⁸

IMRL is a key factor in DM&E's plans for movement of PRB coal and acquisition of control is expected to protect and ensure benefits to be derived from the construction project by guaranteeing that DM&E will have neutral eastern routings for coal movements and direct access to Kansas City and Chicago. Critical to that objective was assurance of an efficient connection at Owatonna. That objective has been secured through a negotiated agreement with Union Pacific as noted in STB FD No. 34178, Decision No.10, served July 9, 2003.

In its prior decision the Board recognized that some of the potential impacts on Rochester associated with rebuilding the existing line might never occur as DM&E has stated it could interchange at least some of its coal traffic at points west of Rochester. (January 2002 Decision, p.21). DM&E now controls the former IMRL through ownership. With that control, it has secured availability of routings it deems to be of key importance to the construction project.

SEA has not undertaken to consider a viable type of "mitigation" not involving limiting the use of horns that would completely eliminate horn noise impacts on Mayo

⁷ SDEIS, p. 1-17.

⁸ 40 C.F.R. 1503.4

(and Rochester) by routing PRB coal traffic onto IC&E lines prior to reaching Rochester. Such routing would also serve to eliminate virtually all other adverse impacts from PRB coal traffic on Mayo and Rochester. SEA admits in the DEIS that routing through Rochester would result in many significant impacts.⁹

The Board previously asserted that it could not require DM&E to take action on property it does not own nor could it impose requirements on a carrier which is not involved in the construction proceeding. (January 2000 Decision, p. 27). Because of DM&E's recent acquisition of IMRL, those impediments no longer exist with respect to the former IMRL. Routing of the PRB coal traffic over the IC&E lines has now become a reasonable and viable alternative that warrants detailed evaluation in direct comparison to DM&E's routing through the City of Rochester. As mandated by the CEQ regulations, the SEA must "present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among options by the decision-maker and the public." (40 C.F.R. 1502.14). Further, SEA's analysis must "rigorously explore and objectively evaluate all reasonable alternatives, giving "substantial treatment" to each alternative that is considered in detail. (40 C.F.R. 1502.14 (b)). The courts have clearly held that failure to consider a viable alternative renders an alternative analysis invalid.

Recently the Board recognized that "[a]n agency is required to supplement an environmental impact statement (EIS) when there are 'significant new circumstances or information relevant to the environmental concerns and bearing on the proposed action or its impacts (40 C.F.R. 1502.9 (c)(1)(ii))." New England Transrail, LLC dba Wilmington

⁹ The CEQ regulations define mitigation, in part, as avoiding environmental impacts. (40 C.F.R. 1508.20).

and Woburn Terminal Railroad Company – Construction Acquisition and Operation Exemption, STB Finance Docket No. 34391, served May 3, 2005. Here acquisition of the former IMRL is acknowledged to be of key importance to the construction application but was not formally sought until immediately after SEA conducted its prior review and the Board served its January 2002 decision in the Construction Proceeding. DM&E's ownership of the former IMRL has converted a possible alternative into reality.

Because an alternative routing over the IMRL clearly has the potential to be significantly more environmentally preferable, it is incumbent upon SEA to comparatively evaluate this alternative. As stated by the court in Calvert Cliff's Coordinating Committee, Inc. v. Atomic Energy Commission, 449 F.2d 1109 (DC Cir. 1971) the evaluation of alternatives seek, "to ensure that each agency decision-maker has before him and takes into proper account all possible approaches to a particular project... which would alter the environmental impact and cost benefit analysis. Only in that fashion is it likely that the most intelligent, optimally beneficial decision will ultimately be made." 449 F.2d at 1114.

The court in City of Carmel-by-the-Sea v. United States Department of Transportation, (123 F.3d 1142 (9th Cir. 1997), held that the range of alternatives considered is inadequate if the nature and scope of the proposed action changes between the draft and final impact statement (here between the DEIS and the FSEIS), and if the agency does not update the list of alternatives considered to reflect these changes. And, in the State of Wisconsin v. Weinberger, 745 F.2d 412 (7th Cir. 1984), the court noted that a supplemental impact statement is not necessary "unless the new information provides a seriously different picture of the environmental landscape such that another

hard look is necessary.” The court further explained that the new information must present “seriously different picture of the likely environment consequences of the proposed action” not adequately discussed in the original impact statement. In the current situation, the ramifications of acquisition of IMRL have not been adequately considered or discussed in the DSEIS. An EIS’s “form, content, and preparation [must] foster ... informed decision-making.” See State of California v. Black, 690 F.2d 753 (9th Cir.1982). Absent a comparative evaluation of routing over the IC&E, the Board would be lacking critical information for formulation of an informed decision in this proceeding.

An agency must consider an alternative even though the implementation of that alternative is not within its jurisdiction or is not authorized by its enabling legislation, SEA’s previously stated limitation in effectively considering alternative routing was said to be due to the Board’s asserted inability to require such routings with carriers who were not parties to the construction proceeding. However, in view of DM&E’s ownership of the former IMRL, that excuse is no longer valid. As stated in Mandelker¹⁰, section 10:30, “Range of Alternatives that must be addressed: “NEPA’s environmental full disclosure mandate will not be met if the agency is allowed to excessively restrict the alternatives it considers.”

Nor can the SEA fulfill its obligations by simply addressing the IMRL alternative in the FSEIS without receiving public comment on that issue. Due to the nature and extent of such additional consideration, public comment is required. Mayo maintains that a revised and expanded DSEIS must be prepared and re-circulated for comment prior to the issuance of a FSEIS in order to properly provide this new information for

¹⁰ Mandelker, Daniel R. NEPA Law and Litigation. West Group, second edition, 1999.

consideration as part of the Board's decision-making process, to legally comply with the procedural provisions of NEPA, and to meet the "hard look" requirement of the courts.

In Marsh v. Oregon Natural Resources Council, 490 U.S. 360 (1989), the Supreme Court considered the duty of agencies to prepare supplemental impact statements and concluded it would be inconsistent with NEPA's purposes "for the blinders to adverse environmental effects, once unequivocally removed, to be restored prior to the completion of agency action simply because the relevant proposal has received initial approval." 490 U.S. at 371.

CONCLUSION

Mayo has participated in these proceedings because of deep seated concern that the proposed movement of PRB coal traffic through Rochester in close proximity to Mayo facilities would seriously strain its ability to continue providing world class health care, cutting edge medical research, and top level teaching in a community environment compatible with the quality and excellence expected of Mayo in all facets of its undertakings.

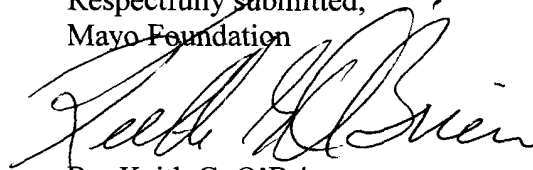
This past year Mayo Clinic Rochester handled over 1.4 million out patient visits while Saint Mary's Hospital accepted over 42,000 admissions and Rochester Methodist Hospital accepted over 18,000 admissions. All of those patients expected and received world-class medical treatment in a community that is conducive to their recovery and hospitable to their families who accompanied them from all over the world.

For all of those who will seek out Mayo for capable treatment and peaceful recovery, as a solid base within which to conduct advanced research, and as a constructive forum in which to teach and train, Mayo urges that SEA has yet to identify and adequately evaluate mitigation not involving limiting use of locomotive horns including the following:

1. Identification of the most sensitive noise receptors and consideration of measures which could mitigate disruption of patient sleep and recovery at Mayo facilities and other highly sensitive populations close to the rail line through Rochester.
2. Careful consideration and evaluation of noise barrier alternatives such as are in use to mitigate highway noise within communities.
3. Thorough evaluation of the readily apparent alternative of routing PRB coal traffic away from Mayo and Rochester over the former IMRL lines which are now essentially owned by DM&E.

The SDEIS should be revised and expanded and thereafter made available for further comment as necessary in light of the foregoing.

Respectfully submitted,
Mayo Foundation



By: Keith G. O'Brien
Rea, Cross & Auchincloss
1707 L Street, N.W.
Suite 570
Washington, DC 20036

Attorney for Mayo Foundation

Dated: June 6, 2005

Proposal

The Study of Environmental Noise Sources and Implementation of Noise
Control Interventions at Mayo Clinic Rochester Hospitals;
“Shh... Patients Healing: Spreading Noise Control”

IRB 2420-E-04 reviewed November 16, 2004

Principal Investigator:	Joyce A. Overman Dube, MS, RN
Co-Principal Investigator:	Melissa M. Barth, MS, RN, CCRN
Co-Investigators:	Cheryl A. Cmiel, BSN, RN
	Susanne M. Cutshall, MS, RN, APRN
	Shelly M. Olson, BSN, RN
	Stephanie J. Sulla, MS, RN
	Steven C. Sobczak, MIS, CSP, CIH
	Jeffrey C. Nesbitt, MS, CSP

Introduction to the Problem

The hospital setting has many noise related activities that disrupt the patients' experience. This issue broadly affects multiple disciplines and departments. In a preliminary continuous improvement project done on one inpatient care unit, Francis 5C (Cmiel et al., 2004), unsolicited comments from patients alerted nurses working the night shift to the noises that were disruptive to patients' sleep. Further investigation by Cmiel et al. revealed that noises occur throughout the day and night that disrupt the patient's hospital experience, which is important as others have reported that noise interferes with the healing process (McCarthy, 1992; Wysocki, 1996). The Francis 5C project included implementation of several interventions to reduce noise and the evaluation data indicated these interventions were successful in reducing noise. Based on the findings and attention given this preliminary project, a Nursing Noise Control Replication Team (hereafter referred to as 'The Team') was formed to design a process for replicating the noise control interventions implemented on Francis 5C to all patient care units (PCU) at Mayo Clinic Rochester Hospitals.

Purpose of the Study

The purpose of this study is to evaluate a replication project aimed at controlling noise levels on all PCUs including Pre-Operative Waiting Areas (PWA) at Mayo Clinic Rochester Hospitals. Environmental noise sources will be identified through an assessment on each PCU. The *Environmental Noise Pre-Assessment* will identify issues that create disturbing noises unique to individual PCUs. Individual PCU Collaborative Practice Framework (CPF) Nursing Leadership groups will implement a minimum of one noise control intervention based on noise sources identified on unit surveys (patient, staff, and CPF Nursing Leadership). CPF Nursing Leadership groups consist of 1 or 2-Nurse Managers (NM), 1-Nursing Education Specialist (NES) and 1-

Clinical Nurse Specialist (CNS), all of which are registered nurses (RN). The Team will implement environmental noise interventions common to all PCUs after initial unit noise assessments are complete. It is predicted that with the completion of the appropriate noise control interventions, the environment in the Mayo Clinic Rochester Hospitals will be quieter for patients, contributing to a healing environment.

Study Aims

- 1) Identify the most bothersome noises in the hospital environment as described by patients, nursing staff and nursing leadership on all patient care units at Mayo Clinic Rochester Hospitals before and after implementation of noise control interventions.
- 2) Describe the five most common bothersome noises and noise control interventions utilized by patient care units at Mayo Clinic Rochester Hospitals.
- 3) Describe the level of noise heard on patient care units before and after implementation of noise control interventions as identified by patients and nursing staff.
- 4) Compare decibel readings before and after implementation of noise control interventions from selected patient care units who choose or are randomly selected to utilize a dosimeter.
- 5) Identify the times of day noise levels are most frequently reported as bothersome on patient care units before and after implementation of noise control interventions as identified by patients and nursing staff.
- 6) Identify noise control interventions common to all PCUs at Mayo Clinic Rochester Hospitals, as measured by the *Patient and Staff Noise Pre-Assessment Surveys* and an *Environmental Noise Pre-Assessment* tool that could be replicated across PCUs.

Background and Significance

Effects of Noise

Research has shown that noise can produce many damaging psycho-physiological effects. Sleep disturbance was demonstrated as a result of noise disturbance by many researchers (Topf, 2001; Aaron, 1996; Zahr, 1995; Freedman, 2001). Stress reactions to noise (Topf, 2001; Morrison, 2003) as well as individual indicators of stress have also been demonstrated in the research literature including increased blood pressure (Fogari, 2001), increased heart rate (Fogari, 2001; Baker, 1992; Katz, 2001; Morrison, 2003; Zahr, 1995) and increased respiratory rate (Zahr, 1995).

In a study done by Morrison (2003) correlating noise with stress, salivary amylase and heart rate, findings showed that noise contributed to higher heart rates and nurses' stress levels. For every increase of 10 decibels (measured in A-weighted decibels [dB(A)] to simulate how the human ear hears), the nurses' average heart rate increased by 6 beats per minute and a 27 point (using a 100 point rating scale) increase in self reported stress ratings was found.

Increased body temperature and motor activity related to noise exposure has been demonstrated in neonates (McCarthy, 1992). In addition, noise exposure has been demonstrated through the literature to cause acute drops in SaO₂ (Zahr, 1995), delayed wound healing and decreased weight gain (Wysocki, 1996), impaired immune function (Redwine, 2000; McCarthy 1992), and hearing loss (Noise and Hearing Loss Consensus Statement 1990).

Increased facial electromyographic (EMG) activity has been documented by Trapanotto (2004), who not only found that louder noises created higher rises in muscle tension, but that muscle tension continued to increase even after exposure to the noise sources ended. Behavioral changes in activity, such as sudden limb and head movements, were also evident following noise exposures and continued to remain evident long after the noises abated (Trapanotto, 2004).

Implementation of Noise Control Interventions

While it has been demonstrated that noise can have many detrimental effects, research has shown that reductions in noise levels can be obtained through staff education and modification of the physical environment. Many of these studies demonstrate effective noise control interventions through staff education and utilizing simple techniques while keeping cost to a minimum.

Staff Education/Behavioral Modifications

A study investigating whether staff education (therefore increasing awareness and knowledge about noise) would decrease noise levels in an intensive care unit setting was conducted by Elander (1995). The most common noise source was conversation. Prior to staff education, conversation occurred during 62% of the recorded periods. Following staff education, conversations occurred during 14% of the recorded periods (144 measurements). The nurses were not aware of the times of the recordings. The researchers recommended that simple interventions such as staff education can reduce noise levels considerably and without additional cost.

Kahn (1998) studied noise levels in an intensive care unit. Following the implementation of a three-week behavior modification program, statistically significant ($p=0.0001$) decreases in mean peak sound levels, as measured in dB(A), occurred in three of four time blocks. Based on these findings, the researchers stated that behavior modification should be strongly advocated and recommended development of an official noise control policy.

Schnelle (1999) utilized behavioral interventions with staff in a nursing home setting to control noise levels. Schnelle's approach involved a staff in-service, feedback on noise sources and levels, noise abatement interventions (such as closing patient's room doors, decreasing television

volumes, and limiting intercom use), and creating individualized patient care plans for incontinence care (thus limiting unnecessary interruptions and therefore producing less noise in those patients' rooms). Noise levels in this study were also measured in dB(A). The behavioral interventions utilized in this study resulted in statistically significant changes in noise levels. Schnelle stated that staff resistance caused difficulty in the implementation of noise control interventions. The authors concluded that behavioral and environmental interventions should be utilized over the entire 24 hours to reduce noise levels even lower than they were able to obtain in their study. In addition, most of the noises identified were within the staff's control and therefore created a compelling argument for the importance of staff education programs.

The development of an environmental noise protocol was studied by Johnson (2003). A five-step process was utilized. They assessed the environment, developed a protocol, educated the staff, implemented the protocol, and evaluated the process. The protocol involved the implementation of a quiet hour during the last hour of each shift. Mean noise levels, as measured in dB(A) were found significantly decreased during the quiet hour.

Environment Modification

The use of acoustical foam inside neonatal incubators was found to be an effective intervention by Johnson (2001). Average noise levels inside the incubators were found decreased by 3.27 decibels. Along with reducing the noise levels, benefits to the patients were also found. Oxygenation improved by one percentage point for all infants as well as improved sleep states as evidenced by a change from a drowsy semi-dozing state to a light REM sleep state. These effects were maintained 10 minutes following the removal of the acoustical foam from the incubator.

Combined Staff Education and Environment Modification

Walder (2000) implemented noise control guidelines to shape staff behavior in a surgical intensive care setting. The guidelines incorporated closing patient room doors systematically, reducing the intensity of alarm sounds, talking in lower voices, coordinating nursing cares and limiting nursing interventions during the night shift as well as refraining from using direct light, telephones, intercoms, televisions, and radios during the night shift. Average noise levels, peak noise levels, and the frequency of alarms sounding, all decreased after the implementation of the guidelines.

A study performed by Walsh-Sukys (2001), looked at reduction of light and sound in a neonatal intensive care unit. Modifications were done over a six-month period. Nursing staff were educated on the potential impacts of light and sound, and a series of sound modifications were done. The various noise control modifications included placing weather stripping on all doors and drawer fronts, replacing any metal garbage cans with plastic cans, placing covers over incubators, installing carpet along the center of the nursery (covering about 28% of floor space), and using sound-absorbent materials in all monitor bays. Their interventions led to lower actual (as assessed by decibel levels) and perceived (as assessed by staff surveys) sound levels. The study demonstrated that reductions in light and sound can be made for relatively modest cost and without impacting patient safety.

In a unit-based project by Cmiel et al. (2004), a decrease in decibel levels was found following the implementation of noise control interventions. The interventions focused on staff education and behavior modification as well as some simple and inexpensive equipment and environmental modifications. Peak noise levels were reduced from 113dB(A) to 86dB(A) following intervention implementation. This is a greater than 80% decrease in peak noise level

intensity. Average noise levels for the entire night shift, as well as the evening and morning shift changes were reduced following the noise control interventions. (Table 1)

Table 1: Dosimeter Results-Decibel Levels dB(A)

Measured Event/Time Frame	Pre-Intervention	Post-Intervention
Highest Peak	113	86
Nighttime Average	45	42
Evening Shift Change Average	53	41
Morning Shift Change Average	50	43

The overall conclusions in many literature references emphasize the importance of staff education, behavior modification, equipment modification, environmental modification, and the creation of guidelines and policies to control noise. This study has broad implications for implementing environmental noise changes across entire hospitals/healthcare systems. While the literature points out many studies evaluating interventions on individual patient care units, there were no studies evaluating the implementation of noise control measures throughout an entire hospital. The Team will summarize data compiled in this study to identify noise control interventions that could be replicated across all PCUs at Mayo Clinic Rochester Hospitals.

Study Design and Data Collection Methods

A descriptive prospective pre and post evaluation design utilizing *Patient and Staff Noise Pre and Post Assessment Surveys* and an *Environmental Noise Pre and Post Assessment* tool will be used to examine the levels of perceived noise present on PCUs before and after implementation of noise control interventions. The Team will compile an Environment Noise Pre-Assessment Packet for each PCU. Contents include:

- *Environmental Noise Education/Information Tool* (Appendix A)

- *Environmental Noise Pre-Assessment*, one copy (Appendix B)
- *Invitation to Participate; Patient*, 30 copies (Appendix C)
- *Patient Survey for Noise Pre-Assessment*, 30 copies (Appendix E)
- *Invitation to Participate; Staff*, sent electronically via E-mail equal to the number of RN, Licensed Practical Nurse (LPN), Patient Care Assistant (PCA) and Unit Secretary (US) staff on the PCU; one paper copy included for reference (Appendix F)
- *Staff Survey for Noise Pre-Assessment*, Online hyperlink sent electronically via e-mail equal to the number of RN, LPN, PCA and US staff on the PCU; one paper copy included for reference (Appendix G)
- Marketing Paper Flyer to Complete Online Staff Survey (Appendix H)

The study goal, purpose and process will be shared at Nursing Division meetings prior to survey distribution. A cover letter will instruct CPF Nursing Leadership group on the specific details of the process that includes distribution and collection of the *Patient and Staff Noise Pre-Assessment Surveys* and the completion of the *Environmental Noise Pre-Assessment*.

Once each CPF Nursing Leadership group has completed the *Environmental Noise Pre-Assessment* during an identified two-week data collection time frame January 10-23, 2005, they will keep the original and send a copy to the Administrative Assistant of the Team.

CPF Nursing Leadership individuals or staff RNs (referred to as consenters- Appendix I) who have completed the IRB training course "Mayo Training Program for Protecting Human Subjects (MTP-PHS)" will obtain patient (or family member) consent and distribute staff surveys during an identified two-week data collection time frame, January 10-23, 2005. The two week time frame was selected to allow completion time for the surveys and *Environmental Noise Pre-Assessment* without prolonging the data collection time frame excessively. Patient surveys will be hand

distributed by a consentor to patients (or family members) on the PCUs. During this time frame, the goal is to collect up to a maximum of 30 patient surveys (family member may complete if the patient is unable). The patient survey will be placed in an attached envelope labeled with the Principal Investigators name and intra clinic mail address and given to the patient's nurse to return via intra clinic mail to the Principal Investigator.

Patient inclusion criteria for this study include ability to read and write in English, alert and oriented, ability to hear environmental noises, and a minimum of 12 hours on the PCU. The number of patient surveys collected in a two week time frame is dependent on many individual unit factors such as unit census, patient population, and willingness to participate in the survey. Data collected from patient surveys will be entered and collated by an identified Administrative Assistant utilizing a Microsoft Access database. Within a month from the start of data collection, summary data report will be returned to each PCU CPF Nursing Leadership groups.

Staff Survey for Noise Pre-Assessment will be completed via a online electronic method. The invitation to participate and the hyperlink to the survey will be emailed to staff by the Administration Assistant to the Team. A marketing paper flyer to complete the web based staff survey (Appendix H) will be posted on each PCU as a visual reminder for all staff to check their email for the survey. Additionally, a follow up e-mail reminder (Appendix J) will be sent to PCU staff 10 days following the original distribution date to complete the *Staff Survey for Noise Pre-Assessment*. The staff survey will collated electronically and stratified reports will be sent to each PCU CPF Nursing Leadership group within a month from the start of data collection.

Data collected from the *Environmental Noise Pre-Assessments* will be entered and collated by an identified Administrative Assistant utilizing a Microsoft Access database. The Team will review

the aggregate data from all PCU *Environmental Noise Pre-Assessments* in order to identify noise control interventions that could be replicated across all PCUs at Mayo Clinic Rochester Hospitals.

Once the *Patient Survey for Noise Pre-Assessment*, *Staff Survey for Noise Pre-Assessment* and *Environmental Noise Pre-Assessments* are complete and the CPF Nursing Leadership group on each PCU receive the reports, they will identify at least one noise control intervention to implement within 2-4 weeks after receiving the summary reports.

CPF Nursing Leadership groups on each PCU will be asked to repeat the survey distribution and collection process 3 months following the initial survey. The Team believes it may take up to two months for the CPF Nursing Leadership group on each PCU receive the reports and complete the plan for implementation of noise control intervention(s), thus a 3 month time frame was chosen for post-implementation evaluation. The Team will compile an Environment Noise Post-Assessment Packet for each PCU. Contents include:

- *Environmental Noise Education/Information Tool* (Appendix A)
- *Environmental Noise Post-Assessment*, one copy (Appendix K)
- *Invitation to Participate; Patient*, 30 copies (Appendix C)
- *Patient Survey for Noise Post-Assessment*, 30 copies (Appendix L)
- *Invitation to Participate; Staff*, sent electronically via e-mail equal to the number of RN, LPN, PCA and US staff on the PCU; one paper copy included for reference (Appendix F)
- *Staff Survey for Noise Post-Assessment*, Online hyperlink sent electronically via e-mail equal to the number of RN, LPN, PCA and US staff on the PCU; one paper copy included for reference (Appendix M)
- Marketing Paper Flyer to Complete Online Staff Survey (Appendix H)

The second data collection process will be the same as the first. The Team will review summary data reports and compare noise levels as perceived by patients before and after intervention(s), noise levels as perceived by staff before and after intervention(s), and types of noises as identified on the *Environmental Noise Assessment* tool before and after intervention(s). The *Environmental Noise Post-Assessment* tool will identify data related to the intervention(s) implemented to control noise and the perceived effectiveness of the intervention(s).

A convenience sample of 12 PCUs will be randomly selected to measure noise levels in decibels, pre and post noise control intervention, over a 24 hour period with the use of a dosimeter. The dosimeters will be placed at a central desk location on the PCUs. The dosimeter readings will be obtained during the same 2 week data collection period. Data collection will begin at 0600. Additionally, individual PCUs will have the ability to request dosimeters. The practicality of collecting dosimeter readings on every PCU prohibits inclusion of all units. The distribution of the dosimeters will be coordinated by the Team with the assistance of the Division of Environmental Safety.

Measurement Tools

Building on previous research and the knowledge gained from the Francis 5C project, the *Environmental Noise Pre and Post Assessment* tools were developed by members of the Team to identify noise sources and interventions on PCUs. The *Staff Survey for Noise Pre and Post Assessment* and the *Patient Survey for Noise Pre and Post Assessment* were developed by the Team, based on information gathered by patients and staff on Francis 5C and input by the Team members. Content validity was established for both patient and staff surveys by having the Team of six experts review a number of drafts and revising the content accordingly. Additional input was

provided by other CPF Nursing Leadership individuals within the Department of Nursing. No further validity or reliability testing has thus far been completed for any of these tools. The Q300 Noise Dosimeter (Quest Technologies) measures a criterion range level of 40-140 decibels. The dosimeter will measure levels of noise on selected PCUs.

Study Variables

Noise: Defined by the patient or staff member completing the survey. This may include elements as identified on the *Patient Survey and Staff Survey for Noise Assessments*.

Sources of Noise: Defined by those completing the noise assessments and could include: individuals or groups of individuals, equipment used in the PCU, etc. Sources of noise will be identified utilizing *Patient and Staff Noise Pre and Post Assessment Surveys* and an *Environmental Noise Pre and Post Assessment* tool.

Noise Control Interventions: Those elements chosen by the patient care units to control the noises identified through the survey process. Noise Control Interventions will be identified utilizing *Environmental Noise Post Assessment* tool.

Dosimeter readings: The measurement of noise in decibels using a dosimeter.

Setting

All PCUs including Pre-Operative Waiting Areas at Mayo Clinic Hospitals, Rochester, MN.

Characteristics of the Study Population

The population for this study will include three groups:

Nursing Staff: (RN, LPN, US, PCA)

A convenience sample of all nursing staff on all PCU/PWA at the Mayo Clinic Rochester Hospitals will be invited to complete the *Staff Survey for Noise Pre and Post Assessment*.

Patients (or family member if patient is unable to complete):

A convenience sample of a maximum of 30 patients (or family member if patient is unable to complete) on each PCU will be invited to complete the *Patient Survey for Noise Pre and Post Assessment*.

CPF Nursing Leadership Groups:

The CPF Nursing Leadership group will complete the *Environmental Noise Pre and Post Assessment* tool on all PCU/PWA.

Estimated Number of Subjects

The sample will consist of those above who voluntarily choose to complete the survey and/or assessment tools.

Patients and/or families = maximum of 1830 (possible 30 patients and/or families X 61 PCUs)

Patient Survey for Noise Pre- Assessment, one copy

Patient Survey for Noise Post-Assessment, one copy

Nursing Staff (PCU) = 3527 on 61 PCUs (RN = 2738 + LPN = 69 + PCA = 422 + US = 298)

Nursing Staff (PWA) RN = 100

Staff Survey for Noise Pre- Assessment, one copy

Staff Survey for Noise Post-Assessment, one copy

CPF Nursing Leadership groups = 148 on 61 PCUs (NM = 62; CNS = 43; NES = 43)

Environmental Noise Pre-Assessment, one copy per PCU CPF Nursing Leadership group

Environmental Noise Post-Assessment, one copy per PCU CPF Nursing Leadership group

Study Interventions

This replication study is being implemented on all PCUs in the Mayo Clinic Rochester Hospitals as an innovations project and is a formal evaluation of its success. The CPF Nursing Leadership group on each individual PCU will determine the noise intervention felt to be most appropriate to implement on the PCU following completion and review of the *Patient and Staff Noise Pre- Assessment Surveys* and the *Environmental Noise Pre-Assessment Tool*. The Team will implement interventions identified as common across all PCUs after completion of the initial surveys and assessment. Information will be shared with all CPF Nursing Leadership groups and staff suggesting common interventions for specific noise issues.

Education

CPF Nursing Leadership groups will coordinate staff education and determine appropriate teaching methods following the completion of the survey tools and assessment. Education will include utilization of the *Environmental Noise Education/Information Tool*. Additional and/or individualized unit education will be provided to staff after the CPF Nursing Leadership groups identify the noise control intervention(s) to be implemented. The AJN article by Cmiel et. al. will be used as a resource and educational tool. Consultation with The Team will also be available upon request.

Protection of Human Subjects

The survey process will be voluntary. There will be no identifying information on the *Patient Survey for Noise Pre-Assessment and Post-Assessment* or the *Staff Survey for Noise Pre-Assessment and Post-Assessment*. All patients will be reassured in a cover letter that participation is voluntary and the decision to participate will not jeopardize their care in any way. All staff will be reassured

in a cover letter that their participation is voluntary and the decision to participate will not jeopardize their employment in any way. The *Environmental Noise Pre Assessment and Post Assessment* tools will not collect any data on human subjects. It is believed that this study is minimal risk to human subjects.

Data Analysis

Data will be analyzed using descriptive summary statistics. A comparison of perceived noise levels before and after unit and hospital wide interventions will be described. The most common noises across all patient care units will be described as well as the most common interventions implemented. Decibel measurement readings will be compared pre and post noise control interventions for those units randomly selected to measure noise levels utilizing a dosimeter.

Timeline

Upon approval of this study, the team of investigators will begin distribution of the Environmental Noise Pre-Assessment Packets to each PCU. The initial data collection is expected to be completed by December 2004. CPF Nursing Leadership groups on each PCU will be asked to look at their data and implement intervention(s) to control noise levels. CPF Nursing Leadership groups on each PCU will again be asked to collect data in approximately 3 months, March 2005, after initial data collection. The team of investigators will distribute the Environmental Noise Post-Assessment Packets to each PCU in March 2005. The Team will collate, summarize and disseminate the findings of the study by June 2005.

Limitations

- 1) Tools not tested, limiting conclusions that can be drawn
- 2) No control of interventions as described above
- 3) One setting with unique patients and staff
- 4) Different patients and staff may complete the pre and post tools
- 5) Convenience sample of patients and staff
- 6) Lack of a randomized, controlled design
- 7) Lack of fidelity or integrity measures to assure nurses are implementing the interventions accurately and reliably
- 8) Lack of consistency expected for the identified interventions and how these are implemented

References

- X Aaron, J. N., Carlisle, C. C., Carskadon, M. A., Meyer, T. J., Hill, N. S., & Millman, R. P. (1996). Environmental noise as a cause of sleep disruption in an intermediate respiratory care unit. *Sleep*, 19(9), 707-710.
- X Baker C. (1992). Discomfort to environmental noise: Heart rate response on SICU patients. *Critical Care Nursing Quarterly*, 15, 72-90.
- X Cmiel, C. A., Karr, D. M., Gasser, D. M., Oliphant, L. M., & Neveau, A. J. (2004). Noise Control: A Nursing Team's Approach to Sleep Promotion. *American Journal of Nursing*, 104(2), 40-48.
- X Elander, G. & Hellstrom, G. (1995) Reduction of noise levels in intensive care units for infants: Evaluation of an intervention program. *Heart and Lung*, 24(5), 376-379.
- Fogari, R., Zoppi, A., Corradi, L., Marasi, G., Vanasia, A., Zanchetti, A. (2001). Transient but not sustained blood pressure increments by occupational noise. An ambulatory blood pressure measurement study. *Journal of Hypertension*, 19, 1021-1027.
- X Freedman, N. S., Gazendam, J., Levan, L., Pack, A. I., & Schwab, R. J. (2001). Abnormal Sleep/Wake cycles and the effect of environmental noise on sleep disruption in the intensive care unit. *American Journal of Respiratory and Critical Care Medicine*, 163, 451-457.
- http://www.quest-technologies.com/Noise/q_series/Q300.htm
- X Johnson, A. N. (2001). Neonatal response to control of noise inside the incubator. *Pediatric Nursing*, 27(6), 600-605.
- Johnson, A. N. (2003). Adapting the neonatal intensive care environment to decrease noise. *Journal of Perinatal and Neonatal Nursing*, 17(4), 280-288.
- Kahn, D. M., Cook, T. E., Carlisle, C. C., Nelson, D. L., Kramer, N. R. & Millman, R. P. (1998). Identification and modification of environmental noise in an ICU setting. *Chest*, 114, 535-540.
- Katz, K., Fogelman, R., Attias, J., Baron, E., & Soudry, M. (2001). Anxiety reaction in children during removal of their plaster cast with a saw. *The Journal of Bone & Joint Surgery (Br)*, 83-B(3), 388-390.
- X McCarthy, D. O., Ouimet, M. E., & Daun, J. M. (1992). The effects of noise stress on leukocyte function in rats. *Research in Nursing & Health*, 15, 131-137.
- Morrison, W. E., Haas, E. C., Shaffner, D. H., Garrett, E. S., & Fackler, J. C. (2003). Noise, Stress, and annoyance in a pediatric intensive care unit. *Critical Care Medicine*, 31(1), 113-119.
- Noise and Hearing Loss. (1990). *NIH Consensus Statement Online*, 8(1), 1-24. From http://odp.od.nih.gov/consensus/cons/076/076_statement.htm

X Redwine, L., Hauger, R. L., Gillin, J. C., & Irwin, M. (2000). Effects of sleep and sleep deprivation on interleukin-6, growth hormone, cortisol, and melatonin levels in humans. *The Journal of Clinical Endocrinology & Metabolism*, 85(10), 3597-3603.

+ Schnelle, J. F., Alessi, C. A., Al-Samarrai, N. R., Fricker, R. D., & Ouslander, J. G. (1999). The nursing home at night: Effects of an intervention on noise, light, and sleep. *Journal of American Geriatrics Society*, 47, 430-438.

X Topf, M., & Thompson, S. (2001). Interactive relationships between hospital patients' noise-induced stress and other stress with sleep. *Heart & Lung*, 30, 237-243.

+ Trapanotto, M. (2004). Behavioural and physiological reactivity to noise in the newborn. *Journal of Paediatric Child Health*, 40, 275-281.

X Walder, B., Francioli, D., Meyer, J., Lancon, M., & Romand, J. (2000). Effects of guidelines implementation in a surgical intensive care unit to control nighttime light and noise levels. *Critical Care Medicine*, 28, 2242-2247.

Walsh-Sukys, M., Reitenbach, A., Hudson-Barr, D., & DePompei, P. (2001). Reducing light and sound in the neonatal intensive care unit: An evaluation of patient safety, staff satisfaction and costs. *Journal of Perinatology*, 21, 230-235.

X Wysocki A B. (1996). The effect of intermittent noise exposure on wound healing. *Advances In Wound Care*, 9(1), 35-39.

Zahr, L. K., & Balian, S. (1995). Responses of Premature Infants to Routine Nursing Interventions and Noise in the NICU. *Nursing Research*, 44(3), 179-185.

Appendix

- A) Environmental Noise Education/Information Tool**
- B) Environmental Noise Pre-Assessment**
- C) Invitation to Participate; Patient**
- E) Patient Survey for Noise Pre-Assessment**
- F) Invitation to Participate; Staff**
- G) Online Staff Survey for Noise Pre-Assessment**
- H) Marketing Paper Flyer to Complete Staff Survey**
- I) List of Consenters**
- J) E-Mail Reminder to Staff**
- K) Environmental Noise Post-Assessment**
- L) Patient Survey for Noise Post-Assessment**
- M) Online Staff Survey for Noise Post-Assessment**

Appendix A

Environmental Noise Education/Information Tool “Shh... Patients Healing: Spreading Noise Control” Replication Team

- ☒ Suggested interventions are listed for your reference
☒ This may assist in identifying information/education needs for the staff on your patient care unit

Suggested Tools	Suggested Intervention
Decibel level measurement	Dosimeter measurements (coordinated by the Team & obtained from safety)
Patient/Family Noise Assessment	Survey
Staff Noise Assessment	Survey
Sources of Noise/Issues	
Equipment	Suggested Intervention
Paper towel dispensers	Folded sheet or non perforated roll
Phone ringer volume	Set to low volume
Hallway phone use	Limit use (certain hours)
Hallway radio volume level	Set to low volume
Cardiac monitor alarm volume (bedside)	Low volume where appropriate
Cardiac monitor alarm volume (nursing station)	Shift appropriate volumes
Pulse oximeter alarm volume	Volume/alarm adjustment
Appropriate monitor alarm settings	◆ Patient specific alarm setting ◆ Volume/alarm adjustment
Cart(s) noise level	Identify source, i.e. wheels, speed
<u>Other:</u>	
Environment/People	Suggested Intervention
Noise issue knowledge deficit	Multidisciplinary Staff Education
Overhead/intercom paging	Limit when appropriate (certain hours)
Paging/calling into patient room to answer call light	Answer call light in person
Nursing shift report	Give in enclosed report room where appropriate
Physician rounds	◆ Lower speaking voice ◆ Limit side conversations
Individual voice volume level	Lower speaking voice
Activity noise levels of staff	Self recognition of volume/activities that may increase noise
Noise transmission into patient room from hallway	◆ Patient door closure ◆ Quiet signs
Noise transmission onto nursing unit from inside patient room	Partial door closure onto unit
Patient interruptions	◆ Grouping cares when appropriate ◆ Eliminate unnecessary interruptions
Roommate noise	◆ Ear plugs (maintenance) ◆ White noise machine
Unnecessary tests &/or procedures	◆ Multidisciplinary collaboration ◆ Eliminate unnecessary test/procedure
Unit based atmosphere	Dim unit lights during eve/night hours to promote quiet atmosphere
<u>Other:</u>	

Environmental Noise Pre-Assessment

Unit: _____

"Shh... Patients Healing: Spreading Noise Control"
Replication Team

- ☒ Please designate a member of your Collaborative Practice Framework (CPF) team to assess perceived noise sources on your patient care unit.
- ☒ The team acknowledges that noise control efforts that may have already been initiated, however, please use this tool to assess the **current** perceived noise sources.
- ☒ Complete this form by **January 23, 2005** and return a copy to **Joyce Overman Dube, EI L-9**. Please retain your original.
- ☒ A **Post-Assessment** is planned for completion by April 2005.

Perceived Noise Sources	Pre-Assessment
Equipment	Check if Current Issue
Non-perforated roll paper towel dispensers	
Perforated roll paper towel dispensers	
Phone ringer volume levels	
Hallway phone use near patient rooms	
Hallway radio volume level	
Cardiac monitor alarm volume (bedside)	
Cardiac monitor alarm volume (nursing station)	
Pulse oximeter alarm volume	
Appropriate (patient specific) monitor alarm settings	
Cart(s) noise level	
Environment/People	
Noise issue knowledge deficit	
Overhead/intercom paging	
Paging/calling into patient room to answer call light	
Nursing shift report given in open areas, near patient rooms	
Physician rounds	
Individual voice volume level	
Activity noise levels of staff	
Noise transmission into patient room from hallway	
Noise transmission onto nursing unit from inside patient room	
Patient interruptions	
Roommate noise	
Unit based atmosphere	
Other	

Appendix C

**Invitation to Participate in
The Study of Environmental Noise Sources and Implementation of Noise Control Interventions at
Mayo Clinic Rochester Hospitals**

Patient (or family member if patient is unable to complete)

You (the patient or family member if patient is unable to complete) are invited to participate in a study to identify environmental noise sources on hospital patient care units. We are interested in the noises you feel disrupt your hospital experience. We hope this information will help to inform and teach caregivers about the things that disrupt a patient's hospital stay and allow us to make changes in the hospital environment to promote a quieter place in which to heal.

If you decide to participate in the study, please complete the attached survey. Return of the survey implies voluntary and informed consent. The survey should take you approximately 5 minutes to complete. Your decision to participate will not influence your care as a patient (or family member of the patient) in any way. If you do not wish to participate, please indicate by checking the box below. Please return the invitation and survey to your nurse.

You may talk to Joyce A. Overman Dube, MS, RN at any time about any questions or concerns you have regarding this study. You may contact Joyce by calling the Mayo operator at telephone (507) 284-2511. You can get more information about Mayo policies, the conduct of this study, or the rights of research participants from Cindy L. Boyer, Administrator of the Mayo Foundation Office for Human Research Protection, telephone (507) 284-2329 or toll free (866) 273-4681.

☐

I choose not to participate in this study.

Patient Survey for Noise Pre-Assessment

Date: _____
Unit: _____

The "Shh...Patients Healing: Spreading Noise Control" Department of Nursing Replication Team would like you (or a family member if patient is unable to complete) to please take some time to reflect on your hospital stay and answer the following questions about the noise levels you encountered. Your feedback will be used to implement future noise control interventions.

Thank you for your time.

1. How would you rate the level of noise that you hear during the **morning (7am-12noon)** on the patient care unit?
☐ Very Quiet ☐ Quiet ☐ Good/Neutral ☐ Loud ☐ Very Loud
2. How would you rate the level of noise that you hear during the **afternoon (12noon-5pm)** on the patient care unit?
☐ Very Quiet ☐ Quiet ☐ Good/Neutral ☐ Loud ☐ Very Loud
3. How would you rate the level of noise that you hear during the **evening (5pm-10pm)** on the patient care unit?
☐ Very Quiet ☐ Quiet ☐ Good/Neutral ☐ Loud ☐ Very Loud
4. How would you rate the level of noise that you hear during the **night (10pm-7am)** on the patient care unit?
☐ Very Quiet ☐ Quiet ☐ Good/Neutral ☐ Loud ☐ Very Loud
5. What time of the day are the noise levels the **MOST** bothersome for you?
☐ Morning ☐ Afternoon ☐ Evening ☐ Night
6. Please identify the **MOST** bothersome noises/activities on the patient care unit:

☐ Telephones	☐ Carts	☐ Voices
☐ Radios	☐ Overhead paging	☐ Traffic
☐ Cardiac monitor/alarms	☐ Pulse oximeter/alarms	
☐ Other _____		
7. Suggestions you may have on how to reduce the noise levels;

Please place the completed survey in the attached envelope and return to your nurse.
© 2004 Mayo Foundation for Medical Education and Research

Appendix F

**Invitation to Participate in
The Study of Environmental Noise Sources and Implementation of Noise Control Interventions at
Mayo Clinic Rochester Hospitals
Patient Care Unit Staff**

You are invited to participate in a study to identify environmental noise sources on hospital patient care units. We are interested in the noises you feel disrupt your patient's hospital experience. We hope this information will help to inform and teach you as caregivers about the things that disrupt a patient's hospital stay and allow us to make changes in the hospital environment to promote a quieter place in which to heal.

If you decide to participate in the study, please click on the hyperlink and complete the survey. Return of the survey implies voluntary and informed consent. The survey should take you approximately 5 minutes to complete. Your decision to participate will not influence your employment at Mayo Clinic Rochester. If you do not wish to participate, please indicate by checking the box: I choose not to participate in this study and click on submit.

You may talk to Joyce A. Overman Dube, MS, RN at any time about any questions or concerns you have regarding this study. You may contact Joyce by calling the Mayo operator at telephone (507) 284-2511. You can get more information about Mayo policies, the conduct of this study, or the rights of research participants from Cindy L. Boyer, Administrator of the Mayo Foundation Office for Human Research Protection, telephone (507) 284-2329 or toll free (866) 273-4681.

Online Staff Survey for Noise Pre-Assessment

The "*Shh...Patients Healing: Spreading Noise Control*" Department of Nursing Replication Team would like you to please take some time to reflect on the noises that patients are exposed to on your patient care unit. Your feedback will direct future noise control interventions.

Thank you for your time.

1. I choose not to participate (scroll down and hit the submit button)
2. Which unit do you work on? (there will be a pick list to select unit)
3. What is your role? ☐ RN ☐ LPN ☐ PCA/NT ☐ US
4. How would you rate the level of noise that you hear during the **morning (7am-12noon)** on your patient care unit?
☐ Very Quiet ☐ Quiet ☐ Good/Neutral ☐ Loud ☐ Very Loud
5. How would you rate the level of noise that you hear during the **afternoon (12noon-5pm)** on your patient care unit?
☐ Very Quiet ☐ Quiet ☐ Good/Neutral ☐ Loud ☐ Very Loud
6. How would you rate the level of noise that you hear during the **evening (5pm-10pm)** on your patient care unit?
☐ Very Quiet ☐ Quiet ☐ Good/Neutral ☐ Loud ☐ Very Loud
7. How would you rate the level of noise that you hear during the **night (10pm-7am)** on your patient care unit?
☐ Very Quiet ☐ Quiet ☐ Good/Neutral ☐ Loud ☐ Very Loud
8. What time of the day are noise levels the **MOST** bothersome for patients? (pick one)
☐ Morning ☐ Afternoon ☐ Evening ☐ Night
9. Please identify the **MOST** bothersome noises/activities on your patient care unit (pick one):
☐ Telephones ☐ Carts ☐ Voices
☐ Radios ☐ Overhead paging ☐ Traffic
☐ Cardiac monitor/alarms ☐ Pulse oximeter/alarms
 Other _____
10. Please check noise control interventions that are currently being used which benefit patients on your patient care unit (pick all that apply).
☐ Ringers turned down ☐ Limit overhead paging ☐ White noise
☐ Alarms turned down ☐ Lower speaking voices ☐ Dim lights
☐ Other sounds turned down ☐ Close patient doors ☐ Quiet signs
☐ Quiet carts ☐ Other _____
11. Please provide additional noise control intervention suggestions you may have:

Click on Submit Button

Marketing Paper Flyer to Complete Staff Survey

(this information would be formatted creatively)

Reminder to All Staff

RN, LPN, PCA, US

Please take a moment to open your email message titled: Noise Study, click on hyperlink and complete the Online Staff Survey for Noise Assessment as part of *The Study of Environmental Noise Sources and Implementation of Noise Control Interventions at Mayo Clinic Rochester Hospitals; "Shh... Patients Healing: Spreading Noise Control"*

The team of investigators are interested in the noises you feel disrupt your patient's hospital experience. We hope this information will help to inform and teach you as caregivers about the things that disrupt a patient's hospital stay and allow us to make changes in the hospital environment to promote a quieter place in which to heal.

- ⇒ Return of the survey implies voluntary and informed consent
- ⇒ Takes approximately 5 minutes to complete
- ⇒ Participation will not influence your employment
- ⇒ Individual responses will remain anonymous
- ⇒ If you do not wish to participate, please check the appropriate box
- ⇒ Questions?? Contact Joyce A. Overman Dube, MS, RN 255-4596 or overmandube.joyce@mayo.edu

Thank you for taking the time to complete this survey!

Appendix I

List of Consenters

[illegible]

Appendix J

E-mail Reminder to Staff

Approximately 10 days ago, you were invited to participate in a study to identify environmental noise sources on hospital patient care units. As you know, the team of investigators are interested in the noises you feel disrupt your patient's hospital experience. We hope this information will help to inform and teach you as caregivers about the things that disrupt a patient's hospital stay and allow us to make changes in the hospital environment to promote a quieter place in which to heal. If you have already have decided to participate in the study by completing the online survey, thank you.

This e-mail is being sent as a reminder to complete the survey if you wish to participate by January 23, 2005. Return of the survey implies voluntary and informed consent. The survey should take you approximately 5 minutes to complete. Your decision to participate will not influence your employment at Mayo Clinic Rochester. If you do not wish to participate, please indicate by checking the box: I choose not to participate in this study and click on submit.

You may talk to the Principal Investigator, Joyce A. Overman Dube, MS, RN 255-4596 or any of the Co-Investigators at any time about any questions or concerns you have regarding this study:

Melissa M. Barth, MS, RN, CCRN 255-7151
Shelly M. Olson, BSN, RN, 255-2605
Cheryl A. Cmiel, BAN, RN, 255-4715
Susanne M Cutshall, MS, RN, APRN, 255-7298
Stephanie J. Sulla, MS, RN, 284-0486
Steven C. Sobczak, MIS, CSP, CIH, 284-4595
Jeffrey C. Nesbitt, MS, CSP, 255-6043

Thank you for your time.

Appendix K

Date: _____
Unit: _____

Environmental Noise Post-Assessment
"Shh... Patients Healing: Spreading Noise Control"
 Replication Team

- Please designate a member of your Collaborative Practice Framework (CPF) team to assess perceived noise sources on your patient care unit. Indicate those noises that remain an issue.
- Identify interventions implemented since the pre-assessment and whether or not you feel they were effective.
- Suggested interventions are listed for your reference. This may assist problem solving perceived noise sources.
- Complete this form by **March 2005** and return a copy to **Joyce Overman Dube, EI L-9**. Please retain your original.

Perceived Noise Sources	Suggested Interventions	Post Assessment	Intervention Assessment
Equipment	Equipment	Check Remaining Issue(s)	Effective Intervention Yes / No
Non-perforated roll paper towel dispensers	Folded sheet or non perforated roll dispenser		
Perforated roll paper towel dispensers	Folded sheet dispenser		
Phone ringer volume levels	Set to low volume		
Hallway phone use near patient rooms	Limit use (certain hours)		
Hallway radio volume level	Set to low volume		
Cardiac monitor alarm volume (bedside)	Low volume where appropriate		
Cardiac monitor alarm volume (nursing station)	Shift appropriate volumes		
Pulse oximeter alarm volume	Volume/alarm adjustment		
Appropriate (patient specific) monitor alarm settings	♦ Patient specific alarm setting ♦ Volume/alarm adjustment		
Cart(s) noise level	Identify source, i.e. wheels, speed		
Environment/People	Environment/People		
Noise issue knowledge deficit	Multidisciplinary Staff Education		
Overhead/intercom paging	Limit when appropriate (certain hours)		
Paging/calling into patient room to answer call light	Answer call light in person		
Nursing shift report given in open areas, near patient rooms	Give in enclosed report room where appropriate		
Physician rounds	♦ Lower speaking voice ♦ Limit side conversations		
Individual voice volume level	Lower speaking voice		
Activity noise levels of staff	Self recognition of volume/activities that may increase noise		
Noise transmission into patient room from hallway	♦ Patient door closure ♦ Quiet signs		
Noise transmission onto nursing unit from inside patient room	Partial door closure onto unit		
Patient interruptions	♦ Grouping cares when appropriate ♦ Eliminate unnecessary interruptions		
Roommate noise	♦ Ear plugs (maintenance) ♦ White noise machine		
Unit based atmosphere	Dim unit lights during eve/night hours to promote quiet atmosphere		
Other	Other		

© 2004 Mayo Foundation for Medical Education and Research

Patient Survey for Noise Post-Assessment

The “Shh...Patients Healing: Spreading Noise Control” Department of Nursing Replication Team would like you (or a family member if patient is unable to complete) to please take some time to reflect on your hospital stay and answer the following questions about the noise levels you encountered. Your feedback will be used to implement future noise control interventions.

Thank you for your time.

1. How would you rate the level of noise that you hear during the **morning (7am-12noon)** on the patient care unit?
☐ Very Quiet ☐ Quiet ☐ Good/Neutral ☐ Loud ☐ Very Loud
2. How would you rate the level of noise that you hear during the **afternoon (12noon-5pm)** on the patient care unit?
☐ Very Quiet ☐ Quiet ☐ Good/Neutral ☐ Loud ☐ Very Loud
3. How would you rate the level of noise that you hear during the **evening (5pm-10pm)** on the patient care unit?
☐ Very Quiet ☐ Quiet ☐ Good/Neutral ☐ Loud ☐ Very Loud
4. How would you rate the level of noise that you hear during the **night (10pm-7am)** on the patient care unit?
☐ Very Quiet ☐ Quiet ☐ Good/Neutral ☐ Loud ☐ Very Loud
5. What time of the day are the noise levels the **MOST** bothersome for you?
☐ Morning ☐ Afternoon ☐ Evening ☐ Night
6. Please identify the **MOST** bothersome noises/activities on the patient care unit:
☐ Telephones ☐ Carts ☐ Voices
☐ Radios ☐ Overhead paging ☐ Traffic
☐ Cardiac monitor/alarms ☐ Pulse oximeter/alarms
Other _____
7. Suggestions you may have on how to reduce the noise levels:

Please place the completed survey in the attached envelope and return to your nurse.

The "*Shh...Patients Healing: Spreading Noise Control*" Department of Nursing Replication Team would like you to please take some time to reflect on the noises that patients are exposed to on your patient care unit. Your feedback will direct future noise control interventions.

Thank you for your time.

1. I choose not to participate (scroll down and hit the submit button)
2. Which unit do you work on? (there will be a pick list to select unit)
3. What is your role? ☐ RN ☐ LPN ☐ PCA/NT ☐ US
4. How would you rate the level of noise that you hear during the **morning (7am-12noon)** on your patient care unit?
☐ Very Quiet ☐ Quiet ☐ Good/Neutral ☐ Loud ☐ Very Loud
5. How would you rate the level of noise that you hear during the **afternoon (12noon-5pm)** on your patient care unit?
☐ Very Quiet ☐ Quiet ☐ Good/Neutral ☐ Loud ☐ Very Loud
6. How would you rate the level of noise that you hear during the **evening (5pm-10pm)** on your patient care unit?
☐ Very Quiet ☐ Quiet ☐ Good/Neutral ☐ Loud ☐ Very Loud
7. How would you rate the level of noise that you hear during the **night (10pm-7am)** on your patient care unit?
☐ Very Quiet ☐ Quiet ☐ Good/Neutral ☐ Loud ☐ Very Loud
8. What time of the day are noise levels the **MOST** bothersome for patients (pick one)?
☐ Morning ☐ Afternoon ☐ Evening ☐ Night
9. Please identify the **MOST** bothersome noises/activities on your patient care unit (pick one):
☐ Telephones ☐ Carts ☐ Voices
☐ Radios ☐ Overhead paging ☐ Traffic
☐ Cardiac monitor/alarms ☐ Pulse oximeter/alarms
Other _____
10. Please check noise control interventions that are currently being used which benefit patients on your patient care unit (pick all that apply).
☐ Ringers turned down ☐ Limit overhead paging ☐ White noise
☐ Alarms turned down ☐ Lower speaking voices ☐ Dim lights
☐ Other sounds turned down ☐ Close patient doors ☐ Quiet signs
☐ Quiet carts ☐ Other _____
11. Please provide additional noise control intervention suggestions you may have:

Click on Submit Button

Shattered peace in Alexandria

Persistent car alarm enrages neighbors

BY DAVID HALE
Examiner Staff Writer

Honking horns and earsplitting car alarms tend to fade into the background amid the hustle and bustle of city traffic, but in the quiet community surrounding Monticello-Lee Apartments in Old Town Alexandria where

dow and the alarm still ringing in her ears, said Singleton.

Because the car was parked on private property at 724 S. St. Asaph St., police informed Singleton they were powerless to have the vehicle towed and employees of Scott Management refused to get involved, she said. Finally, another neighbor, nearly a block away, called the police once again and the car was removed.

"And the horn was going off all the way down the street," Singleton said.

Amy Bertsch, a spokeswoman for the Alexandria Police Depart-

"By the second day I was physically shaking. I'd had no sleep." — Debra Singleton, an Alexandria resident, who was disturbed by a car alarm outside her apartment.

Debra Singleton resides, one obnoxious alarm provided nearly three full days of constant annoyance.

A malfunctioning alarm in a silver Saturn parked just outside the bathroom window of Singleton's first-floor apartment provided a near-constant soundtrack of beeping, despite repeated calls to the Alexandria Police Department and Scott Management Inc., the property management company that owns the apartment complex, she said.

"By the second day I was physically shaking. I'd had no sleep," said Singleton, who was supposed to be resting after recent surgery. "I was in tears on the phone with the on-site manager. I was begging them to do something about it."

Although the police responded to Singleton's calls three separate times from May 22 to May 24, each time they left with the car still parked beneath her win-

ment, said there were specific requirements that had to be met before the city could tow the car, but that police should have intervened sooner than they did.

"The property management could have had it towed right away," she said. "From a police standpoint, it takes a little longer to occur."

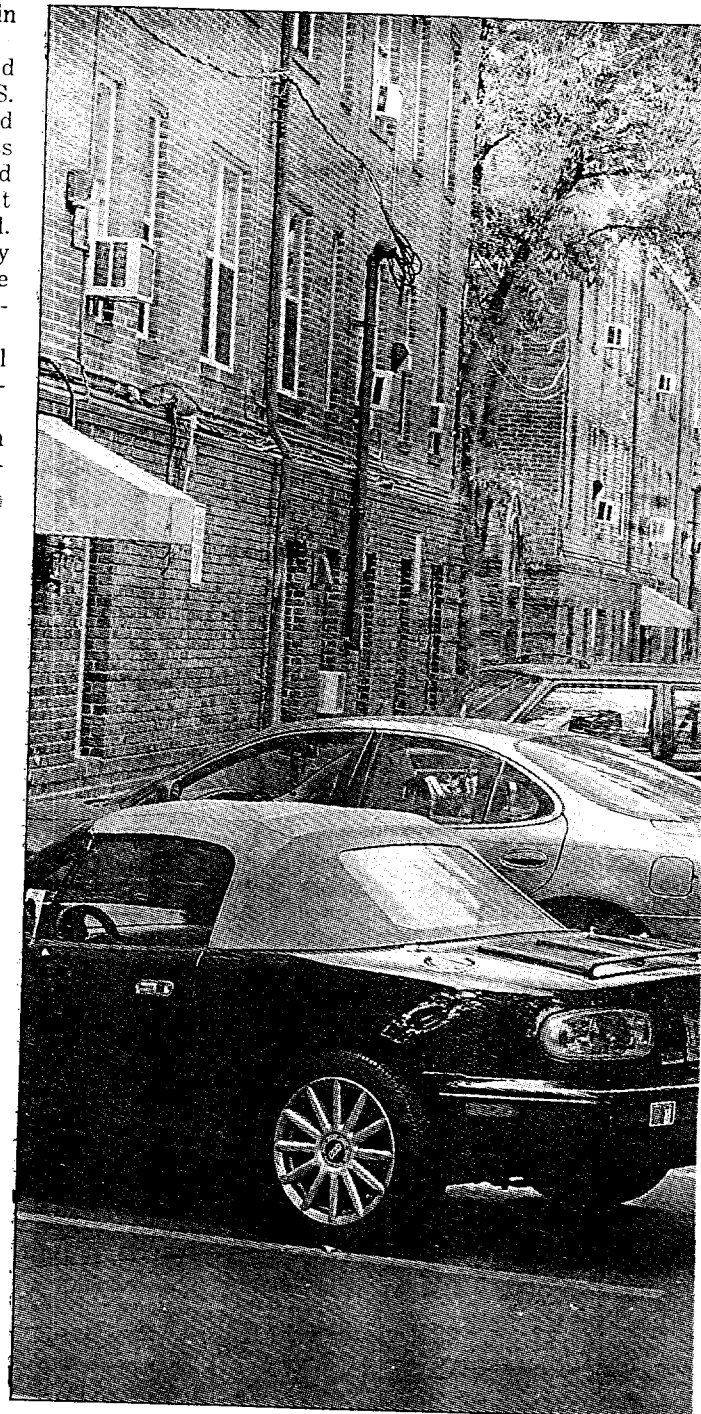
Despite repeated calls from *The Examiner*, no one from Scott Management was available for comment.

Bertsch said that police were able to locate one of the car's owners after the initial call and have her disarm the alarm. However, the honking quickly returned and the owner could not be contacted again.

Bertsch said the police department control staff was looking into the matter, but it's too little, too late for Singleton.

"I don't understand why their own cops don't know what to do," she said.

d hale@dcexaminer.com



Jeff Mankie/Ex

Alexandria residents near the intersection of South St. Asaph and Jefferson streets were treated to a car horn blaring for several days recently.