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Health Risk Assessment in Dependent Children Living in Military Housing review of current and future procedure

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2.Al-Uyoun health center
3.Blood Donation Center in Al-othaim Mall
4.Ministry of Health Alahssa Cluster
5.Dammam Medical Complex
6.Al-Qurain Primary Healthcare Center
7.KING FAHAD HOSPITAL HUFOF
8.Al Ayoune City General Hospital
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Abstract- Health risk assessments (HRAs) in military housing, particularly those addressing lead-based paint exposure in dependent children, are crucial for safeguarding child health. Children living in military housing units constructed before 1978 may be at risk of lead exposure due to deteriorating lead-based paint. This comprehensive review evaluates current and future procedures for conducting HRAs in military housing to assess, mitigate, and manage lead exposure risks. We examine existing risk assessment protocols, including environmental inspections, blood lead level testing, and remediation efforts, while also identifying gaps in implementation. Additionally, the review proposes future directions for improving risk assessment practices, such as enhancing inspection protocols, expanding data tracking, and increasing public education efforts. By addressing these challenges, the review aims to strengthen health risk management and improve health outcomes for children in military housing.

1. Introduction

Lead exposure in children is a serious public health concern, particularly in housing units built before 1978, which may contain lead-based paint. In the U.S. military, where families move frequently, children are often exposed to various housing conditions, including potentially hazardous

environments with deteriorating lead paint. Lead exposure in children is linked to developmental delays, cognitive deficits, and behavioral problems(1). This review provides a comprehensive evaluation of the Health Risk Assessments (HRAs) for dependent children living in military housing. We aim to analyze current practices and outline future procedures that could enhance the safety of children in military housing and mitigate the risks posed by lead exposure.

2. Background: Health Risks of Lead-Based Paint Exposure

Lead-based paint, once a common material in homes built before 1978, remains a significant environmental health hazard for children in military housing. The risks are particularly acute for dependent children due to their developing nervous systems and behavioral patterns, such as hand-to-mouth activities, that increase their exposure(2). Studies indicate that even low levels of lead exposure can impair neurological development and lead to lower IQs, attention issues, and increased risk for developmental disorders (3). Given the transient nature of military families, children may encounter multiple housing units with undetected or inadequately addressed lead hazards, further exacerbating their risk .

3. Current Procedures for Health Risk Assessment in Military Housing

3.1. Housing Inspections and Lead Hazard Identification

The primary strategy for identifying lead exposure in military housing involves housing inspections conducted by military housing authorities. Units built before 1978 are regularly inspected for deteriorating lead-based paint, a common source of lead dust contamination. The U.S. Department of Defense (DoD) provides guidelines for these inspections, which include both **visual assessments** and more detailed **environmental testing**. Visual inspections focus on deteriorating paint and high-risk areas like windowsills, doorframes, and floors. Environmental lead testing is then conducted, with lead dust or paint samples being analyzed for contamination levels(4).

Despite these efforts, the effectiveness of inspections may vary by region or military installation, leading to inconsistent outcomes in identifying housing units with lead hazards (5).

3.2. Blood Lead Level Screening

Blood lead level testing is a crucial component of health risk assessments in military housing. Routine blood tests are recommended for children under six years of age, particularly those residing in older housing units at risk of lead exposure. Elevated blood lead levels (EBLLs) in children signal significant exposure and trigger further intervention, including additional environmental testing and remediation . Regular testing ensures that children at risk are identified and that immediate action can be taken to prevent further exposure. However, challenges remain in ensuring that testing is conducted universally across military housing populations .

3.3. Remediation and Mitigation Strategies

Upon identifying lead hazards, the military follows remediation procedures that include removing or stabilizing lead-based paint. The DoD's guidelines specify strategies for mitigating lead exposure, such as repainting contaminated surfaces with lead-free paint or encapsulating deteriorating lead paint with safer materials (6). For severe cases, full lead paint removal or even complete renovation of affected units may be required. Although these remediation efforts have helped reduce the risks of lead exposure, inconsistent application of these strategies can leave some families in unsafe living conditions, especially when renovation funds are limited.

3.4. Educational Programs and Family Engagement

Education about lead hazards is a critical part of the military's health risk management approach. Military families are provided with information about the risks of lead exposure and are encouraged to follow safe cleaning practices, such as regularly washing children's hands and keeping homes dust-free. Additionally, families are advised to participate in **preventive health education programs**, which inform them of the symptoms of lead poisoning and the importance of blood lead level testing.

4. Challenges with Current Procedures

4.1. Inconsistent Implementation and Follow-Up

One of the major challenges in the current HRA procedures is the **inconsistent implementation** of inspections and follow-up procedures. While some military installations have stringent inspection schedules, others may lack the resources to conduct timely and thorough evaluations. Delayed or inconsistent remediation efforts are particularly problematic, as children may continue to live in environments with ongoing lead hazards.

4.2. Limited Scope of Assessment

The current HRAs predominantly focus on lead exposure, but they may overlook other environmental hazards in military housing, such as exposure to asbestos, radon, or indoor air quality issues. A more comprehensive assessment approach that includes these additional environmental factors would help ensure a safer overall living environment for military families.

4.3. Data Gaps and Limited Tracking

Another limitation is the **lack of comprehensive data tracking** for lead exposure in military housing. While blood lead testing is conducted, there is often limited follow-up to assess the long-term health impacts of early exposure. Additionally, there may be gaps in monitoring the effectiveness of remediation efforts across different installations .

5. Future Procedures and Recommendations

5.1. Enhanced Risk Assessment Protocols

Future procedures should involve a **more comprehensive approach** to health risk assessments, including evaluating other environmental hazards beyond lead. Expanding the scope of HRAs to include factors such as radon exposure, mold, and air quality could help better protect children's health. The **use of advanced technologies** (e.g., remote sensing or AI-assisted detection tools) could improve the efficiency and accuracy of inspections .

5.2. Standardization and Increased Frequency of Inspections

A national standard for **military housing inspections** would ensure that all installations follow the same protocols and that inspections are conducted at consistent intervals. To address the transient nature of military families, **annual reassessments** could be implemented to catch lead hazards early and prevent chronic exposure .

5.3. Improved Data Tracking and Long-Term Monitoring

Establishing a **centralized database** to track lead exposure, blood lead levels, and remediation efforts across military housing would enable better monitoring of trends and health outcomes. Long-term health tracking is essential to evaluate the **cumulative effects** of lead exposure and ensure that families receive timely interventions .

5.4. Strengthening Family Education and Involvement

Military families should receive **enhanced educational programs** that focus on lead-safe practices, signs of lead poisoning, and the importance of routine testing. Increased engagement through community outreach and online resources could empower families to participate actively in ensuring the safety of their living environments .

5.5. Policy and Resource Allocation

To address these challenges, increased funding for **remediation and health risk management** programs is necessary. Policymakers should prioritize the **safety of children** in military housing by supporting legislation that allocates resources for lead hazard control and health risk assessments.

6. Conclusion

The current procedures for health risk assessments in military housing provide a foundational framework for managing lead exposure risks to children. However, there are significant gaps in the consistency and scope of these assessments. Future procedures should include enhanced risk assessment protocols, more frequent and standardized inspections, improved data tracking, and greater engagement with military families. By addressing these challenges, the military can better safeguard the health and well-being of dependent children, ensuring that they grow up in safer environments free from lead and other environmental hazards.

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