Wartime Military Deployment and Increased Pediatric Mental and Behavioral Health Complaints

WHAT'S KNOWN ON THIS SUBJECT: Military deployment of a parent influences children’s behavior in a variety of settings. The clinical significance of these deployment-associated behavior changes has not been determined.

WHAT THIS STUDY ADDS: Children experiencing separation from a parent due to wartime military deployment have a 11% increase in outpatient visits for mental and behavioral health complaints, which contrasts with a general deployment-associated decrease in health care visits in all other diagnostic categories.

abstract

BACKGROUND: Children of military personnel face stress when a parent deploys.

OBJECTIVE: Our goal was to determine the effect of parental military deployment on the relative rate of outpatient visits for mental and behavioral health disorders in children aged 3 to 8 years.

METHODS: This was a retrospective cohort study. Records of children of active-duty personnel during fiscal years 2006 and 2007 were linked with their parent’s deployment records. Mental and behavioral health visits were identified by using International Classification of Diseases, Ninth Revision, codes. The incidence rate ratio (IRR) of visits per year according to parental deployment status was determined with random-effects negative binomial regression modeling with longitudinal data analysis.

RESULTS: A total of 642,397 children aged 3 to 8 years and 442,722 military parents were included. Mean child age was 5.0 years (SD: 1.9 years); 50.6% were male, and 68.0% were white. Ninety percent of the parents were male, and 90.5% were married; 32.0% of the parents were deployed during the study. There were 1,049,081 person-years with 611,115 mental and behavioral health visits (0.6 visit per year). The IRR of mental and behavioral health visits for children with a deployed parent compared with when a parent was home was 1.11 (95% confidence interval [CI]: 1.07–1.14; P < .001). IRRs of pediatric anxiety, behavioral, and stress disorders when a parent deployed were 1.14 (95% CI: 0.98–1.32; P = .095), 1.19 (95% CI: 1.07–1.32; P < .001), and 1.18 (95% CI: 1.10–1.26; P < .001), respectively. Older children and children with military fathers and married parents had larger increases in rates of mental and behavioral health visits during parental deployments. In contrast, the overall outpatient rate and rates of visits for other diagnoses decreased when a parent was deployed.

CONCLUSIONS: Mental and behavioral health visits increased by 11% in these children when a military parent deployed; behavioral disorders increased 19% and stress disorders increased 18%. Rates especially increased in older children and children of married and male military parents. Pediatrics 2010;126:000

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ABBREVIATIONS

ICD-9—International Classification of Diseases, Ninth Revision
IRR—incidence rate ratio
CCS—Clinical Classification System
CI—confidence interval

The views expressed in this article are those of the authors and do not necessarily reflect the official policy or position of the Department of the Navy, Department of Defense, or the US government.

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Families experience multiple stressors associated with military service by a parent. Frequent moves, prolonged absences of a parent during military deployment, and the risk of a parent’s death are examples of such stressors. When a parent deploys, the separation of parent and child influences the child’s current and future development. Similar effects of child separation from a parent have been documented in a variety of settings, including divorce and parental incarceration, migration, or hospitalization.

In a 2006 survey of military spouses, 20% of parents reported that their children coped poorly during military deployments. Children of deployed parents exhibit more internalizing and externalizing behaviors, especially when a parent deploys to a combat zone. Deployment of a parent has been associated with maladaptive behavior, and decreased academic performance. Child maltreatment rates are also increased during deployment. The effects of deployment can also differ depending on the gender of the deployed parent. These observations, however, have not directly linked parental deployment to clinically significant pediatric mental or behavioral health disorders. Changes in behavior that lead a caregiver to seek medical attention for a child signal a more significant impact of parent-child separation than cross-sectional measurements or surveys of child behavior. Studies that have examined the effect of parental deployment on inpatient psychiatric hospitalization have been small and provided differing results. We hypothesize that military deployment of a parent leads to increased outpatient visits for pediatric mental and behavioral health complaints. The goal of this study was to determine the effect of parental military deployment on the relative rate of outpatient visits for mental and behavioral health disorders in children aged 3 to 8 years.

PATIENTS AND METHODS
All data were obtained from the Tricare Management Activity, which oversees all health care delivery for the US military and their family members in both the civilian and military sectors (in the United States as well as abroad). Military beneficiaries aged 3 to 8 years enrolled in the military health system at the end of fiscal year 2006 or 2007 were identified from the Defense Enrollment Eligibility Reporting System (DEERS). Age was determined at the end of the fiscal year. The age range of 3 to 8 years was chosen because it excluded the younger ages at which there are frequent well-child visits, corresponded to the ages included in previous studies that documented subclinical behavior changes, and included the developmental stage at which one of the authors (Dr. Gorman) had observed an increase in behavioral concerns in his pediatric practice. Children of National Guard or Reserve personnel were excluded. Each subject’s demographic information and enrollment date were extracted. Subjects without an electronic data interchange patient number (EDIPN), a unique identifier common to Department of Defense databases, were excluded. Likewise, subjects whose parent did not have an EDIPN were excluded.

The Tricare Management Activity maintains the Standard Ambulatory Data Record and the noninstitutional care database of all outpatient visits for military family enrollees inclusive of care received from military and civilian providers. Claims for included subjects from October 1, 2005, through September 30, 2007, were extracted when the subjects were as young as 2 years 1 day and as old as 8 years 11 months. Claims were excluded if they occurred before the child’s date of enrollment in the military health system or after the parent’s exit from the military. Each claim was categorized by its primary diagnosis (International Classification of Diseases, Ninth Revision [ICD-9], code) into 1 of 18 multilevel diagnostic groupings, including a category for mental and behavioral health disorders, by using the Clinical Classification System (CCS) of the Agency for Healthcare Research and Quality. In addition, each claim was categorized according to a more restrictive classification of mental and behavioral health disorders used in a similar study of US Army wives. Claims were further subcategorized as pertaining to pediatric anxiety disorders, behavioral disorders, or stress disorders.

Deployment dates were provided by the Defense Manpower Data Center, which also supplied data on start and stop dates for all deployments and demographic information such as age, military rank, service branch, and marital status. All deployments, including but not limited to combat deployments, were included. The electronic data interchange patient number of the parent provided a link between the data sets.

Each subject’s outpatient visits were merged with the parental deployment record. Each visit was categorized as occurring during or not during a period of deployment. The total number of visits according to CCS category was summed for each child for each period of exposure (deployment and nondeployment). All subjects contributed exposure time from the start of each fiscal year in which they were registered in the Defense Enrollment Eligibility Reporting System, truncated on the basis of the dates of their military benefits eligibility status.

Variables
Variables in the analysis included child age and gender and parental marital
status, gender, military rank, and deployment status. Nonnormally distributed variables were stratified according to quartiles. Parental military rank was classified as Junior Enlisted (E0–E6), Senior Enlisted (E7–E9), Warrant Officer (WO1–W4), Junior Officer (O1–O3), and Senior Officer (O4–O10).

**Analytic Plan**

The incidence rate ratio (IRR) of visits per year according to parental deployment status was determined with random-effects negative binomial regression modeling with longitudinal data analysis. Negative binomial regression can determine the relative rate of counted events such as outpatient visits. Longitudinal analysis is the analysis of data from multiple points of time for a single subject. Deployment status was considered an external time-dependent variable, meaning that it was an exposure that varied over time and was not a characteristic of the subject. Covariates considered as potential confounders were child age and gender and parental age, gender, marital status, and military rank. Interactions between deployment and potential confounders were considered for inclusion in all models. An interaction was defined as when the effect of 1 variable was different depending on the presence or absence of another variable. Stratified analyses, when separate analyses were performed after dividing subjects into separate groups, were conducted when there were significant interactions.

**RESULTS**

There were 746,125 children aged 3 to 8 years in the Defense Enrollment Eligibility Reporting System database for fiscal years 2006 and 2007. Of these children, 103,728 (13.9%) were excluded because they did not have an active-duty non-National Guard, non-Reservist parent. The remaining 642,397 (86.0%) children could be linked to an active-duty parent. The mean age of included children was 5.0 years (SD: 1.9 years); 50.6% were male, 68.0% were white, and 22.0% were black. Included children did not differ significantly from the 103,728 excluded children by gender (49% female versus 48% male) or race but were slightly and significantly older (5.0 ± 1.9 vs 4.9 ± 1.8 years; \( P < .001 \)). Characteristics of included children and their parents are listed in Table 1. Included subjects contributed 1,049,081 person-years for analysis. Included children were linked to 442,722 active-duty parents. The median age of the parents was 34 years (interquartile range: 28–39 years). Forty-five percent of the parents were deployed during the 2-year period; for these parents, the median number of days deployed was 196 (interquartile range: 118–343 days). Military parents contributed 125,219 person-years of deployment time, which was 11.9% of the person-years of the included children.

There were 4,121,624 outpatient visits recorded by TriCare Management Authority during fiscal year 2006 and 4,263,809 outpatient visits in fiscal year 2007 for children aged 3 to 8 years. Visits at civilian facilities accounted for 65.0% of visits. Of all visits, 1,700,875 (20.2%) were excluded because they could not be linked to an included child. In addition, 74,439 duplicate claims (0.9%), were excluded and 13,778 claims (0.2%) were excluded because they had no electronic data interchange patient number.

**TABLE 1 Clinical Characteristics of 642,397 Children and Their 442,722 Military Parents**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>All Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean ± SD, y</td>
<td>5.0 ± 1.9</td>
</tr>
<tr>
<td>Male, %</td>
<td>50.6</td>
</tr>
<tr>
<td>Race, %</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>68</td>
</tr>
<tr>
<td>Black</td>
<td>22</td>
</tr>
<tr>
<td>Other</td>
<td>10</td>
</tr>
<tr>
<td>Parent deployed during time period, %</td>
<td>32</td>
</tr>
<tr>
<td>Age of parent, median (IQR)</td>
<td>34 (28–39)</td>
</tr>
<tr>
<td>Male military parent, %</td>
<td>90</td>
</tr>
<tr>
<td>Branch of service of parent, %</td>
<td></td>
</tr>
<tr>
<td>Army</td>
<td>45</td>
</tr>
<tr>
<td>Air Force</td>
<td>26</td>
</tr>
<tr>
<td>Navy</td>
<td>13</td>
</tr>
<tr>
<td>Marines</td>
<td>7.4</td>
</tr>
<tr>
<td>Married parents, %</td>
<td>90.5</td>
</tr>
<tr>
<td>Rank of Parent, %</td>
<td></td>
</tr>
<tr>
<td>Junior Enlisted (E1–E6)</td>
<td>12.4</td>
</tr>
<tr>
<td>Senior Enlisted (E7–E9)</td>
<td>65.8</td>
</tr>
<tr>
<td>Warrant Officer (WO1–WO4)</td>
<td>2.4</td>
</tr>
<tr>
<td>Junior Officer (O1–O3)</td>
<td>7.8</td>
</tr>
<tr>
<td>Senior Officer (O4–O10)</td>
<td>11.6</td>
</tr>
</tbody>
</table>

IQR indicates interquartile range; E1, first and lowest enlisted rank; WO1, first and lowest warrant officer rank; O1, first and lowest officer rank.
Among these visits, there were 23,561 visits for pediatric anxiety disorders, 40,600 visits for behavioral disorders, and 95,796 visits for stress disorders. The rates of anxiety disorders, behavioral disorders, and stress disorders were 22.4, 38.7, and 91.3 visits per 1000 person-years, respectively.

**Outpatient Visits: Unadjusted Analyses**

During 923,972 person-years when a military parent was at home, there were 5,746,830 outpatient visits recorded for included children. During 125,219 person-years when a parent was deployed, there were 729,725 outpatient visits recorded. In unadjusted longitudinal analysis, the IRR of outpatient visits during a parent’s deployment compared with when a parent was home was 0.89 (95% CI: 0.88–0.90; \( P < .001 \)). Unadjusted rates for all other categories of outpatient pediatric visits decreased when a parent was deployed (Fig 1).

Rates of pediatric anxiety disorders, behavioral disorders, and stress disorders increased for children when their parent deployed (Table 3). There were 26.7 excess visits per 1000 person-years (95% CI: 17.5–36.0) for anxiety disorders when a parent was deployed. There were 6.5 (95% CI: 5.3–7.8) and 22.3 (95% CI: 20.3–24.2) excess visits per 1000 person-years when a parent was deployed for behavioral and stress disorders, respectively. The relative rate of anxiety disorders in children when their parent was deployed was 1.14 (95% CI: 0.98–1.32; \( P = .095 \)). The relative rate for pediatric behavioral disorders was 1.19 (95% CI: 1.07–1.32; \( P = .001 \)), and it was 1.18 (95% CI: 1.10–1.26; \( P < .001 \)) for stress disorders.

Rates of mental and behavioral health visits also suggested an interaction between military parent’s gender and deployment. When a mother deployed, the outpatient visit IRR was 0.73 (95% CI: 0.72–0.73; \( P < .0001 \)) compared with 0.96 (95% CI: 0.958–0.964; \( P < .0001 \)) when a father deployed.

**Mental and Behavioral Health Visits: Unadjusted Analyses**

In unadjusted longitudinal analysis, the IRR of outpatient mental and behavioral health visits during a parent’s deployment compared with when a parent was home was 1.11 (95% CI: 1.07–1.14; \( P < .001 \)). Unadjusted rates for all other categories of outpatient pediatric visits decreased when a parent was deployed (Fig 1).

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Children of female military parents experienced an IRR of 0.70 (95% CI: 0.67–0.75; P < .0001) for mental and behavioral health visits when the mother was deployed compared with an IRR of 1.19 (95% CI: 1.19–1.20; P < .0001) for children of male military parents when the father deployed. An interaction between deployment and parent marital status also existed. For children of single parents, the IRR when the military parent was deployed was 0.91 (95% CI: 0.89–0.93; P < .0001) compared with 1.21 (95% CI: 1.20–1.22; P < .0001) for children of married military parents. No interaction between child gender and parental gender was evident.

**Multivariate Analysis**

In the multivariate models, there was a significant interaction between the parent’s deployment and child age, and the parent’s gender and marital status (Table 4). The strongest interaction involved a positive interaction between male military parents and deployment.

The IRRs of the effect of deployment on mental and behavioral health visits for these 3- to 8-year-old children, stratified according to the gender of the military parent, parental marital status, and child’s age, are shown in Table 5. In all strata of child age and parental marital status, the IRR was higher for children of male military parents than female military parents. This effect was more pronounced in children of married parents than those of single parents. IRRs also increased with child age in all strata of military parent’s gender and marital status. Similar patterns were observed in subanalyses of pediatric anxiety, behavioral, and stress disorders (data not shown).

**DISCUSSION**

Results of this study show a clinically significant 11% increase in outpatient visits for mental and behavioral health care complaints for these children of military parents during a parent’s deployment. Pediatric behavioral and stress disorders increased 18% and 19%, respectively, when a parent was deployed. The significance of these increased rates is more marked when contrasted with an 11% decrease in all health care visits for this population when a parent was deployed. The general decrease in outpatient visits may reflect increased demands of a functionally single caregiver who must choose which conditions merit the effort of bringing a child to medical attention. There was a significant interaction between military deployment and the gender of the military parent on outpatient mental and behavioral health care rates; children of male military parents had increased rates compared with children of female military parents. This result suggests parental gender-specific differences in the behavioral response of children to deployment, recognition of child issues during deployment, the inability to bring these issues to professional attention, or a combination of these factors. A child’s age and the parent’s marital status also interacted with the parental deployment; older children and children of married parents had increased rates of outpatient mental and behavioral health visits. Our results add to the findings of recent previous studies that documented deployment-related changes in child behavior by linking them to clinically apparent psychological and behavioral issues that merit the clinical attention of a pediatric provider. Previous research has documented the differences between paternally and maternally separated children. One possible explanation is that the mothers remaining at home may be more likely to manifest their own mental health issues or that mothers are more likely to transfer their own mental health symptoms onto the child. In the 2006 Military Spouse Survey, 62% of spouses reported an increase in anxiety during a deployment.
male) of deployed Marines in 2003 were seen by a mental health specialist. Maternal depression is associated with increased perception of mental health issues in their children, as well as an increased number of outpatient visits for these concerns. Future studies that adjust for confounders in examinations of the separation experienced by children of military families in terms of its potential for parental mortality and its repetitive nature, but this situation does not occur on the same scale as the separation caused by military deployments as described in this study. Future analyses will be needed to determine if the effects of deployment on parent-child separation persist into adulthood. In long-term studies of children evacuated and separated from their parents during World War II bombings in Europe, increased rates of mental health problems have been reported 6 to 7 decades after the experience. However, Finnish adults who were separated from their father in World War II because of military deployment had no adult mental health sequelae because of their experience, which is in contrast to children separated from their parents as a result of evacuation. Our study was limited by reliance on clinical diagnosis and provider coding for identification of mental and behavioral health diagnoses and not on standardized clinical definitions. Initial diagnoses of mental and behavioral health conditions could not be identified. In military treatment facilities where provider compensation is not linked to coding, there is little incentive for providers to code outpatient visits completely. The restriction of our analysis to primary diagnoses limits the effect of misdiagnoses and captures the true nature of the chief complaint of these visits. We also included outpatient visits billed by nonmilitary provid-
ers, who presumably have greater fi-
nancial incentive to accurately code.

The CCS categorized some conditions
(eg, developmental delay, autism,
speech disorders) that may develop in-
dependently of parent deployment as
mental and behavioral health disor-
ders, although previous authors have
made an association between develop-
mental delay and parental mental
health.

We did not attribute these
diagnoses directly to parental deploy-
ment; however, we did include them in
the definition, because there may be
increased recognition of these disor-
ders or worsening of the clinical man-
ifestations, especially when there is
family stress. The use of this ac-
cepted classification system for claims
data, as well as previously published
categories of more tightly defined
mental and behavioral health diag-
oses, decreases ascertainment bias
and improves reproducibility.

We could not identify families in which
both parents were in the military. In
the US military, 2.5% of active-duty,
service-member parents are married
to military spouses. This limitation
could have conflicting effects on the
observed relative rates in families of
dual-military parents. Increased rates
may occur because of higher stress
from both parents being alternately
deployed or because of ascertainment
bias from the other military parent
having better access to the military
health system. Conversely, the effect
of deployment might be attenuated
because the nondeployed spouses
have built-in support systems in
their military unit. Unidentified dual-
military families may lead to time
misclassification as nondeployed ex-
sposure time when the second military
parent is deployed.

We also did not subcategorize military
deployments into predeployment, de-
ployment, or postdeployment phas-
es. There may be specific periods
in a deployment cycle when mental
health complaints are more likely to
surface. Because our analysis covered
2 fiscal years and included parents
who deployed multiple times for vary-
ing durations, we believe stratifying
time-at-risk into similar phases may
lead to misclassification.

Potential confounders were also not
included in the analysis. Because we
did not have access to the parents’
medical records, depression and
other mental health conditions could
not be factored into our analyses. Al-
though parents’ perception of their
children’s mental health reliably pre-
dicts clinical conditions, there may
be a differential ascertainment bias
because depressed mothers perceive
their children’s mental health prob-
lems more frequently than nonde-
pressed mothers—the “depression-
distortion hypothesis.” Because
depression and other mental health
disorders are common among female
spouses of deployed male military
members, this phenomenon should
cautions against assigning direct cau-
sality between parental deployment
and pediatric visits for mental and be-
havioral health issues.

This study’s primary strength is the
large number of included children dur-
ing a period of intense deployment
stress. The rate of US military deploy-
ments was high during the study pe-
riod and included combat operations
and increased coverage by the media.

An integrated database with direct
linkages between a parent’s deploy-
ment history and a child’s medical
record strengthens the precision of
timing the outcomes and exposures
used in the study. Longitudinal data
techniques excluded between-subject
variation as a source of error. Previ-
ously published classification systems
for identification of the primary out-
come measure reduced possible error
or bias.

CONCLUSIONS

Separation of a child from a parent be-
cause of the parent’s military deploy-
ment was associated with an 11% in-
crease in the rate of outpatient visits
for mental and behavioral health con-
ditions in these 3- to 8-year-old chil-
dren despite associated decreases in
visits for all other categories of outpa-
tient visits. Mental health and behav-
ioral conditions came to clinical atten-
tion at greater rates during parental
military deployment for older children,
for children of married parents, and
for children of male military service
members. These findings are espe-
cially important for nonmilitary pedia-
tricians, who provide almost two-
thirds of outpatient care for the
children of military parents. Providers
and policy makers should continue
their focus on supporting military fam-
ilies before, during, and after deploy-
ments in developmentally appropriate
ways. Our results reinforce the impor-
tance of providing additional support
to children of parents who are fre-
cently deployed and the parent or
caregiver who remains at home to
care for them.

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data as well as the accuracy of the
data analysis.

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