

## Genitourinary Trauma in the Military: Impact, Prevention, and Recommendations

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During the recent conflicts in support of Operations Iraqi Freedom, Enduring Freedom, and New Dawn, the increased reliance on dismounted patrols and frequent exposure to improvised explosive devices (IEDs) have amplified the presence of a relatively new type of trauma – genitourinary (GU) trauma.<sup>1,3</sup> The GU system includes genitals, bladder, urinary tract, and kidneys. It is estimated that approximately 12 percent of war injuries involve some kind of GU trauma.<sup>2</sup> In general, advanced technology, medicine, and equipment have boosted survival rates and many service members return home injured.<sup>4-8</sup> Despite the increasing presence of GU trauma over the last decade, its impact on sexual, reproductive, psychological, and relationship functioning remains understudied. Here we provide a brief overview of GU trauma and the association with physical, psychological, and sexual challenges. This brief focuses on multiple levels of prevention to describe the scope of the problem and identify areas for improvement. As part of the discussion, specific policy recommendations and application strategies are provided.

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### A New Kind of Trauma: GU Trauma

Until recently, renal trauma was the most common type of GU injury. Presently, the “signature” injury of combat involves a combination of lower limb amputation, pelvic fracture, and severe perineal injury.<sup>1,9</sup> Recent research on young, male military personnel (i.e., under 40 years old) indicated that approximately 7 percent sustained genital injuries during military service.<sup>10</sup> Data from the Joint Theater Trauma Registry (JTTR) indicated that approximately 5 percent of 16,323 trauma admissions between 2001-2008 involved GU injuries.<sup>11,12</sup> The majority of these injuries were to the scrotum (29%), followed by the kidney (22.9%), bladder (21.3%), penis (14.2%), testicle (9.1%), ureter

(2.7%), and urethra (0.8%).<sup>11</sup> Similar research has found injury to external genitalia to account for the largest portion (over 70%) of all GU injuries.<sup>13</sup> Over half (65%) of the GU injuries were due to explosions, 14.8 percent from penetrating trauma (firearms), 10.6 percent from blunt trauma, and 1.2 percent from burns.<sup>11</sup>

Explosions are a primary source of injury in the recent conflicts. The use of dismounted combat operations have led to more numerous exposure to IED explosions, which has been a leading cause of GU injuries. For U.S. operations in Afghanistan, the use of dismounted patrols resulted in 350 percent more GU trauma, compared to U.S. operations in Iraq.<sup>9</sup> Other JTTR research found that over 50 percent of GU injuries during a one year period in Iraq were due to explosions.<sup>14</sup> Gunshot wound to the penis was also a leading cause of GU injury.<sup>13</sup>

### Primary Prevention of GU Injury

Primary prevention of GU injury is largely dependent on the use of personal protective equipment (PPE), including the use of a pelvic protection system (PPS). The U.S. PPS consists of two tiers of protection. Tier 1 is a protective undergarment (PUG) that is made of a knitted silk material with an antimicrobial agent. The PUG can be worn as or over underwear; mitigates wound infection; and reduces penetration of dirt and debris.<sup>15</sup> Tier 2 is a protective out-garment (POG) that is made Kevlar (DuPont, Wilmington, Delaware) between ballistic silk materials. The POG is worn over trousers and reduces penetration of fragments and larger debris.<sup>15</sup> U.S. military personnel who deploy to combat are provided with body armor and, on an as needed basis, the PPS, which provides some protection against lower velocity projectiles and explosions.<sup>14,15</sup>

While the initial round of PPS was designed for men, a specific design for women is necessary and should involve a higher waistline for additional protection. While the PPS provides protection against GU trauma, there is still a substantial risk of injury. Research indicates a significantly lower rate of overall GU injury in casualties who wore body armor at the time of injury compared to those who were not wearing body armor.<sup>14</sup> It is important to note that not all injured military personnel were wearing PPS. Although the U.S. Army Research Laboratory has developed a

laboratory testing methodology to evaluate the material response of the PPS against a variety of threats, little to no evaluation data is available.<sup>16,17</sup> Moreover, little is known about the distribution of and compliance with the PPS in combat, or about its use in female military personnel. This is an area that needs to be further investigated to determine reasons for not wearing PPS – it may be that the equipment was not available, not functioning properly, uncomfortable, or some other reason. To comprehensively assess the effectiveness and protective impact of PPS, researchers should consider on-the-ground usability, compliance, sustained usage, and gender differences in usage, in addition to the protective effects. Overall, GU injuries are unique and serious injuries that have been on the rise, which necessitate innovative approaches to prevention, treatment, and management.

## First Response to GU Trauma

GU injuries sustained on the battlefield have several levels of treatment.<sup>15</sup> At the point of injury on the battlefield, the first level of medical care is through self-aid or from battle buddies or combat medics, if available. After evacuation, the injured service member is sent to either a level 2 facility, which consists of a small medical company able to aid several inpatients and often provides rapid surgical intervention, or a level 3 facility, which is a larger Combat Support Hospital located within the combat zone and has a urologist on staff. Level 4 care is located outside of the combat zone and offers definitive medical and surgical care. Level 5 care is provided in U.S. hospitals and offers long-term rehabilitation and recovery.

The American Urologic Association (AUA) recently released guidelines for the medical treatment of urotrauma.<sup>18</sup> While the guidelines offer the potential benefit of reducing mortality among service members with GU injury, there may also be drawbacks that can substantially impact health and quality of life. For example, available surgical and prosthetic treatments have previously been linked with various health consequences, including urinary and sexual difficulties, anxiety, infertility, sexual dissatisfaction, and loss of personal and sexual identity.<sup>19-21</sup> Thus, truly comprehensive treatment of GU trauma must account for the physical, psychological, social, sexual, and reproductive health consequences of the GU injury and the subsequent medical treatments. Such strategies require a collaborative and interprofessional approach to treatment of GU injuries, which is lacking from current approaches.<sup>22,23</sup>

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## Long-Term Management of GU Trauma

GU injuries often require a long-term management of side effects, which may include physical, fertility, psychological, and sexual function consequences, among others.<sup>9,10</sup> However, the long-term outcomes of GU injuries are largely unknown, as little research has focused on this area. It is clear that the effects of GU injuries can be lasting, impact multiple areas of life and functioning, and can be costly.

### Physical Consequences

In 2011, the Department of Veterans Affairs (VA) expanded coverage of an existing short-term financial benefit for long-term injuries, Service Members Group Life Insurance Traumatic Injury Protection Program (TSGLI) Traumatic Injury Protection Program, to include GU injury.<sup>24</sup> The TSGLI provides severely injured service members up to \$100,000 to aid in recovery, of which up to \$50,000 can be provided for GU injuries.<sup>24</sup> The financial benefit, however, can quickly become capped due to other non-GU injuries. Thus, service members who sustain multiple severe injuries do not receive TSGLI compensation above the \$100,000 maximum. Moreover, the costs of long-term treatment may exceed the TSGLI limits, thus requiring out-of-pocket costs for injuries sustained in combat.

### Fertility

In addition to the TSGLI short-term financial benefit for long-term services that are needed, the military provides limited coverage to address injury-associated infertility. Fertility problems are common in those with GU injuries due to the nature of the injury. Recent research on British service members with GU injury indicated more positive psychological outcomes when future fertility is known at an early stage.<sup>25</sup> To comprehensively aid in recovery, coverage for the multifaceted consequences of GU injury should be provided.

Currently, Tricare provides limited diagnostic and treatment coverage for assisted reproductive services. However, Tricare restricts coverage of in vitro fertilization (IVF) and other assisted reproductive services (e.g., sperm/egg retrieval, artificial insemination, blastocyst implantation, and cryopreservation and storage of embryos) to severely ill or injured active duty service members who are legally married and have lost the natural ability to reproduce due to the illness/injury.<sup>26,27</sup> The coverage, however, requires that the severely ill/injured active duty males can produce sperm and females have ovarian function and uterine cavity to allow the carrying of a fetus; third-party donations and surrogacy are not covered.<sup>27</sup> In addition to the limited coverage of certain assisted reproductive services by Tricare, some military treatment facilities (MTFs) provide low-cost assisted reproductive services, including IVF.<sup>28</sup> However, there are often lengthy waits for services and often lengthy travel required, as only few MTFs around the country provide such services.

## Psychological & Sexual Functioning

GU trauma can also have long-term psychological consequences, in addition to the physical effects. While there is a dearth of research evaluating the psychological burden of GU trauma, the available research suggests a number of psychological health implications. Specifically, there is a higher prevalence of depression and PTSD in those with GU trauma, as well as a slower recovery process, greater distress, and more suicidal behavior than those without these types of injuries.<sup>29</sup> The physical and psychological injuries that military populations experience, place them at greater risk for sexual functioning problems. Recent research indicates that military personnel with a genital injury are approximately 10 times more likely to report sexual functioning problems than those without a genital injury.<sup>10</sup> While Tricare does not provide psychotherapy in connection with sexual dysfunction, it does provide limited psychotherapy sessions for other covered behavioral health problems or when medically/psychologically necessary for a diagnosed medical condition.<sup>30</sup>

## Key Findings and Recommendations

In response to the research findings and treatment gaps, below are key findings with specific recommendations for addressing each. These efforts have the potential to improve the well-being and quality of life of injured military populations.

### Finding 1

There are currently two tiers of PPS that are available on a limited basis to service members in certain combat locations, but among those who are injured, not all have worn the PSS. Moreover, few studies have comprehensively evaluated the effectiveness and protective impact of PPS.

### Recommendation

Conduct a comprehensive assessment of currently available PPS, on-the-ground use, compliance, sustained usage, and gender differences, as well as protective effects. If necessary, propose updates in design and dissemination of PPS and then re-evaluate the updated equipment.

### Discussion

The current system of pelvic protection being employed by the military has shown preliminary success in reducing the severity GU injuries sustained during combat. However, there is still a need for a comprehensive assessment of the current distribution and usage dynamics, the potential effectiveness for long-term successful adoption, and gender differences in injury impact and usage. There is little known about the protective equipment available to women and how PPS varies in structure or performance compared to PPS for men. Results on these topics will aid in the development of innovative improvements in the equipment to enhance

protective impact and short- and long-term usage. This initiative would also fit well with the Task Force on Urotrauma, as proposed in House of Representatives (H.R. 984),<sup>31</sup> which proposes the establishment of a task force on urotrauma. Specifically, the task force would evaluate the incidence, duration, and morbidity and mortality of urotrauma, as well as the social and economic costs, and include an analysis of existing resources, research and programs aimed at enhancing prevention and treatment. The culmination of this research would be a long-term comprehensive plan for addressing urotrauma.

### Finding 2

First responses to GU trauma are essential and currently have a well-structured system in place. This system can be further improved by incorporating collaborative and inter-professional approach to treatment of GU injuries.

### Recommendation

Incorporate collaborative, interprofessional teams into patient care from the beginning of treatment.

### Discussion

The identification and treatment of GU injuries are often difficult to treat as the symptoms often overlap with multiple diagnoses involving multiple disciplines. An interprofessional approach provides a promising solution to this challenge by ensuring that providers from multiple disciplines work collaboratively to assess, diagnose, and treat patients with these perplexing traumatic injuries.<sup>32</sup> The need for well-coordinated collaboration across providers has been widely acknowledged, but few have implemented such approaches to patient care.<sup>33</sup> Collaborative, interprofessional approaches have advantages for patients, providers, and the health care delivery system.<sup>34</sup> However, working within an interdisciplinary team requires specific skills, knowledge, and abilities. Providers must understand roles and acknowledge each unique area of expertise. Offering innovative opportunities for providers to receive training in these skills will be essential in preparing effective interdisciplinary teams.

### Finding 3

There are limited benefits that address the long-term management of GU trauma and the associated consequences of GU injury.

### Recommendation

Expand benefits and coverage of the long-term consequences of GU injuries, including physical, fertility, psychological, and sexual functioning-related consequences, among others. Expand TSGLI and Tricare programs for service members who have experienced a GU injury.

## Discussion

The TSGLI provides insurance benefits for severely wounded service members. However, the payment amount may not exceed \$100,000 and those with multiple losses do not receive more benefits to cover their additional losses. Moreover, the long-term costs to treat the additional injuries often require costs beyond what is provided, which are not accounted for in the TSGLI. In addition to the limited life insurance benefit, health insurance coverage for some of the consequences of GU is also limited. Fertility coverage, in particular, is limited. While basic assisted reproductive services are available, men who have lost testicles or otherwise cannot produce sperm are limited in their options to reproduce, as sperm donation is not covered. The same is true to women who have lost ovaries or cannot produce eggs; donor eggs and surrogacy are not covered. Additionally, sexual functioning and fertility counseling may not be available through current insurance programs. Thus, service members with a GU injury and their family members are left without comprehensive treatment for injuries sustained in combat.

## Conclusions

GU injuries have become more prevalent in recent years as dismounted patrols have increased. Most GU injuries involve the external genitalia and can have long-term consequences. While protective equipment is provided to those at high risk of GU injuries, not all wear the provided equipment for reasons that are unclear. More research needs to focus on improving existing PPS and improving usage compliance and long-term adoption of PSS in both men and women. For those who sustain injuries, there is a need to provide comprehensive treatment approaches early into the care plan to help reduce the subsequent impact of the injury. Interprofessional teams can help address various aspects of functioning. Physicians, nurses, social workers, physician assistants, and other health care professionals must coordinate their efforts and share common goals of providing, holistic, patient-centered care. Disparity emerges when teams of professionals must function interdependently in the workforce while the standard is to be trained in isolated programs.<sup>35-37</sup> To reduce the burden of the long-term consequences of GU injury, it is important to provide adequate benefits and insurance coverage. Current policies do not provide adequate coverage of many of the consequences of GU injury, including fertility, psychological, and sexual functioning.

## References

- <sup>1</sup> Sharma, D.M., Webster, C.E., Kirkman-Brown, J., Mossadegh, S., & Whitbread, T. (2013). Blast injury to the perineum. *Journal of the Royal Army Medical Corps*, 159(Suppl 1):i1-i3.
- <sup>2</sup> Woodward, C., & Eggertson, L. (2010). Homemade bombs and heavy urogenital injuries create new medical challenges. *Canadian Medical Association Journal*, 182(11):1159-1160.
- <sup>3</sup> Ficke, J.R., Eastridge, B.J., Butler, F.K., et al. (2012). Dismounted complex blast injury report of the army dismounted complex blast injury task force. *Journal of Trauma and Acute Care Surgery*, 73(6):S520-S534.
- <sup>4</sup> Warden, D. (2006). Military TBI during the Iraq and Afghanistan wars. *Journal of Head Trauma Rehabilitation*, 21(5):398-402.
- <sup>5</sup> U.S. Department of Defense. (2014). *U.S. casualty status*. <http://www.defense.gov/news/casualty.pdf>. Accessed September 25, 2014.
- <sup>6</sup> Gawande, A. (2004). Casualties of war—military care for the wounded from Iraq and Afghanistan. *New England Journal of Medicine*, 351(24):2471-2475.
- <sup>7</sup> Tanielian, T., & Jaycox, L.A. (2008). *Invisible wounds of war: Psychological and cognitive injuries, their consequences, and services to assist recovery*. Santa Monica, CA: RAND Corporation; 499.
- <sup>8</sup> Goldberg, M.S. (2010). Death and injury rates of US military personnel in Iraq. *Military Medicine*, 175(4):220-226.
- <sup>9</sup> Han, J.S., Edney, M.T., & Gonzalez, C.M. (2013). Genitourinary trauma in the modern era of warfare. *Journal of Men's Health*, 10(4): 124-128.
- <sup>10</sup> Wilcox, S.L., Redmond, S., & Hassan, A.M. (2014). Sexual functioning in military personnel: Preliminary estimates and predictors. *Journal of Sexual Medicine*, 11(10):2537-2545.
- <sup>11</sup> Serkin, F.B., Soderdahl, D.W., Hernandez, J., Patterson, M., Blackburn, L., & Wade, C.E. (2010). Combat urologic trauma in US military overseas contingency operations. *Journal of Trauma*, 69(Suppl 1):S175-178.
- <sup>12</sup> Waxman, S., Beekley, A., Morey, A., & Soderdahl, D. (2008). Penetrating trauma to the external genitalia in Operation Iraqi Freedom. *International Journal of Impotence Research*, 21(2):145-148.
- <sup>13</sup> Hudak, S.J., & Hakim, S. (2009). Operative management of wartime genitourinary injuries at bald air force theatre hospital, 2005 to 2008. *Journal of Urology*, 182:180-183.
- <sup>14</sup> Paquette, E.L. (2007). Genitourinary trauma at a combat support hospital during Operation Iraqi Freedom: The impact of body armor. *Journal of Urology*, 177(6):2196-2199.

- <sup>15</sup> Williams, M., & Jezior, J. (2013). Management of combat-related urological trauma in the modern era. *Nature Reviews Urology*.
- <sup>16</sup> U.S. Army Research Laboratory. (November 2014). Beyond protection: ARL expertise in terminal effects, material response investigates next-level groin protection systems. *ARL News*. Retrieved from <http://www.arl.army.mil/www/default.cfm/default.cfm?article=1338>.
- <sup>17</sup> U.S. Army Research Laboratory. (2014). *2013-2014 Assessment of the Army Research Laboratory: Interim Report*. Washington, D.C.: National Research Council.
- <sup>18</sup> Morey, A.F., Brandes, S., Dugi III, D.D., et al. (2014). Urotrauma: AUA guideline. *Journal of Urology*, 192: 327-335.
- <sup>19</sup> Bullen, K., Edwards, S., Marke, V., & Matthews, S. (2010). Looking past the obvious: experiences of altered masculinity in penile cancer. *Psycho-Oncology*, 19(9):933-940.
- <sup>20</sup> Shaeer, O. (2010). Supersizing the penis following penile prosthesis implantation. *Journal of Sexual Medicine*, 7(7):2608-2616.
- <sup>21</sup> Stein, R., Stockle, M., Fisch, M., Nakai, H., Muller, S.C., & Hohenfellner, R. (1994). The fate of the adult exstrophy patient. *Journal of Urology*, 152(5 Pt 1):1413-1416.
- <sup>22</sup> Bray, J.R. (2013). Genitourinary trauma: A battle cry for integrated collaborative veteran-centric care. *Journal of Men's Health*, 10(4):121-123.
- <sup>23</sup> Tepper, M.S. (2014). Sexual healthcare for wounded warriors with serious combat-related injuries and disabilities. *Sexual Medicine Reviews*, 2(2):64-74.
- <sup>24</sup> U.S. Department of Veterans Affairs. (2013). *TSGLI Loss Standards*. [http://www.benefits.va.gov/insurance/tsgli\\_schedule\\_schedule.asp](http://www.benefits.va.gov/insurance/tsgli_schedule_schedule.asp). Accessed January 14, 2015.
- <sup>25</sup> Lucas, P.A., Page, P.R.J., Phillip, R.D., & Bennett, A.N. (2014). The impact of genital trauma on wounded servicemen: Qualitative study. *Injury*, 45(5):825-829.
- <sup>26</sup> Tricare. (2014). *Assisted reproductive services*. <http://www.tricare.mil/CoveredServices/IsItCovered/AssistedReproductiveServices.aspx>.
- <sup>27</sup> Tricare. (2008). *TRICARE operations manual 6010.56-M*. <http://manuals.tricare.osd.mil/DisplayManual.aspx?SeriesId=OPERATIONS>.
- <sup>28</sup> Resolve. (August 2013). *Infertility care for military personnel*. Retrieved from <http://www.resolve.org/support/infertility-and-the-military/>.
- <sup>29</sup> Dismounted Complex Blast Injury Task Force. (2011). *Dismounted complex blast injury: Report of the Army dismantled complex blast injury task force*. Fort Sam Houston, TX: Author.
- <sup>30</sup> Tricare. TRICARE provider handbook: Your guide to TRICARE programs, policies, and procedures. October 2013; [https://www.unitedhealthcareonline.com/ccmcontent/ProviderII/UHC/en-US/Assets/ProviderStaticFiles/ProviderStaticFilesPdf/Tools%20and%20Resources/Policies%20and%20Protocols/TRICARE\\_Provider\\_Handbook\\_2013.pdf](https://www.unitedhealthcareonline.com/ccmcontent/ProviderII/UHC/en-US/Assets/ProviderStaticFiles/ProviderStaticFilesPdf/Tools%20and%20Resources/Policies%20and%20Protocols/TRICARE_Provider_Handbook_2013.pdf).
- <sup>31</sup> To direct the Secretary of Defense to establish a task force on urotrauma. Rep. Guthrie BR-K-, trans. 113th Congress (2013-2014) ed2013.
- <sup>32</sup> King, H.B., Battles, J.B., Baker, D.P., et al. (2008). *TeamSTEPS™: Team strategies and tools to enhance performance and patient safety*. Vol 3. Rockville, MD: Agency for Healthcare Research and Quality.
- <sup>33</sup> Greiner, A.C., & Knebel, E. (2003). Institute of Medicine. Committee on the Health Professions Education Summit. *Health professions education: A bridge to quality*. Washington, DC: National Academy Press.
- <sup>34</sup> Grant, R., & Finocchio, L. (1995). *Interdisciplinary collaborative teams in primary care: A model curriculum and resource guide*. Pew Health Professions Commission.
- <sup>35</sup> Interprofessional Education Collaborative Expert Panel. (2012). Core competencies for interprofessional collaborative practice: Report of an expert panel, 2011. *Washington, DC, Interprofessional Education Collaborative*.
- <sup>36</sup> Willhaus, J. (2012). A nursing perspective on simulation and interprofessional education (IPE): A report from the National League for Nursing's Think Tank on using simulation as an enabling strategy for IPE. *National League of Nursing*.
- <sup>37</sup> Paige, J.T., Garbee, D.D., Kozmenko, V., et al. (2014). Getting a head start: High-fidelity, simulation-based operating room team training of interprofessional students. *Journal of the American College of Surgeons*, 218(1):140.

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