Temple Fire Burn Injury
Facilitated Learning Analysis

Incident Date: June 10, 2017
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Cover photo: Location on the Temple Fire where burn injury occurred.
THE STORY

Fire singed the Sawyer’s beard as he fumbled with the buckles on his chaps. Heat leapt up at his face, rising from the fire that engulfed the ground at his feet...his chaps...his pants. “Drop and roll!” the Swamper yelled. He rolled in the dusty void between junipers, then stood with chaps around his ankles. Water from their nearby packs extinguished the remaining flames on his nomex pants near his ankles.

Up to this moment, the 60 acre wind-driven fire had kept the module’s three saw teams busy most of the day, as they leapfrogged along the edge of the fire. This was the first time this particular saw acted up all day, dying mid-cut through a branch of a small juniper tree as flames crawled up from the base. After trying to restart it a few times, the Sawyer walked into the green and popped off the cap. The fuel tank was still half-full, so he closed the cap, believing that it was fully sealed. Unbeknownst to the Sawyer, fuel leaked out of the saw’s tank and onto his chaps as he walked back to the juniper. The fire that consumed his legs and feet blew up after he approached the tree again to finish the cut. He would later learn that two other resources on the fire also experienced issues that day with fuel caps that wouldn’t seal properly on chainsaws of similar make and model. In both cases, the fuel caps were replaced without incident.

He wasn’t sure and it didn’t matter at this point how it happened, because now he was burned and it was serious. The Swamper used his EMT knowledge to gage the magnitude of the red, sooty burns on the Sawyer’s thighs and calves as the other module members hurried in. Another EMT from the module noticed the singed beard and checked his mouth and nose for any signs that the heat had damaged his respiratory system, but found nothing. A space blanket provided some protection for his burned skin from the gusty winds, dust, and ash. Although the Sawyer was alert and talking, the EMTs knew that he needed to get off the hill and to the hospital as quickly as possible. The injured Sawyer felt lightheaded with a tingling/numb sensation in both hands, the beginning signs of shock. The EMTs would have liked to provide oxygen, but the trucks that contained this equipment were parked on the opposite end of the fire: not enough time to get it to the Sawyer. The EMTs used the 9-Line, Medical Incident Report pages 108-109 of the 2014 Incident Response Pocket Guide (IRPG), as a guide to collect and relay information to dispatch.

Almost simultaneous with patient assessment, dirt tossed into the fuel tank stopped the steady boil of flames rising from the saw. At this point, the fuel cap was not noticed. Shortly, other module members bumped the gear off the line as the fire gathered intensity in that area when several nearby junipers lit up. Firefighters worked to minimize the fire spread as the Sawyer was escorted gingerly further into the green.

The Incident Commander (IC) Trainee requested that someone drive a truck to the area to transport the Sawyer to the nearby County Road. Shortly afterward, a County deuce and a half, a large military surplus type 4 engine, lumbered up the two-track, and executed an eighteen-point...
turn; the dust and noise adding to the commotion around the injured Sawyer who was now waiting near the road. They immediately realized that this was not the right vehicle to move the patient and clarified that a pickup with at least an extended cab was needed for this task.

An ambulance ordered by dispatch hurried to the scene. Initially the arrival time was unknown, but dispatch soon relayed that the ambulance would be there in 10 minutes. Conversations in the field considering the best way to get the Sawyer headed toward the hospital resulted in concurrence that the ambulance was the quickest, easiest, and most comfortable way to get him there. The agency helicopter that had been working the fire was contacted by the IC Trainee and agreed to reconfiguring from buckets to patient transport, just in case. Another, better equipped ambulance was also headed to the site. The EMTs continued to do what they could for comfort and applied small packets of burn gel.

Luckily, they were essentially sitting on a two-track road and the IC’s truck was driven to the injured Sawyer’s location. Firefighters quickly and efficiently moved gear from the extended cab into the back of the truck, making space for the EMT’s to lift him into the cab. They were now ready to get him down to the county road. By this time, it was about 30 minutes after the initial injury and blisters were just

Figure 3: Approximate location of equipment recovered from the site. The saw and chaps were removed from their original locations when fire activity increased shortly after the injury.
starting to show up. It was an uncomfortable ride down the two-track, but it was less than ½ mile, so the Sawyer was able to lift himself off the seat, protecting the backside of his legs from contact.

![Temple Fire Burn Injury Map 06/10/2017](image)

**Figure 4:** Map of Temple Fire perimeter and surrounding area showing the accident location, patient pickup location, two-track road, and location where patient was loaded onto the ambulance.

Back at Dispatch, the BLM Unit Duty Officer (Unit DO), Agency Administrator (AA) and Trainee AA had just started working together on the Wildland Fire Decision Support System (WFDSS) for the Temple Fire and another fire on the unit when the medical call came in. The Temple IC Trainee sounded calm as she reported a medical incident around 1544. At this point, she didn’t know what was going on, but was briskly walking toward the accident location as she reported it to Dispatch.

By 1549, Dispatch had an initial assessment from module EMT. Hearing that it was a burn injury, the Unit DO immediately reflected back to a recent burn injury and flipped open the Interagency Standards for Fire and Fire Aviation Operations document, better known as the Red Book, to take a look at the burn protocol. Reviewing the pages with the others gathered in Dispatch yielded discussion about what they could really do from their end to influence a referral to a burn center. The Red Book lists specific criteria that trigger referral to the nearest regional burn center, but it was not clear what the agency’s role was in making this decision. Pages 171-173 of the Red Book were flipped repeatedly as people tried to decide if and how the burn protocol “requirements” applied to this situation. The vague language of the burn protocol was difficult to negotiate. Everyone wanted to make sure the burned Sawyer got the
appropriate immediate and follow-up care and that the costs would be covered by worker’s compensation.

Adding to the already hectic atmosphere in Dispatch, at 1605 a massive order for air support (5 heavy air tankers and 7 seats) came in from an air attack who was scouting the newly discovered Hunter Fire on the South Zone that was now threatening a residence and oil and gas infrastructure. Further complicating the situation, a non-related vehicle accident on a nearby major highway was preventing access needed by resources to get to the Hunter Fire.

Stress levels were high as the folks gathered at the Dispatch/BLM office struggled to understand the severity of the medical information coming across the radio frequencies. The patient was conscious and breathing; the module EMTs wanted to stick with the ambulance; and the report was that 2% of his thighs was estimated burned. The description of the injury didn’t seem too bad. However, the EMT clearly stated that the urgency was “red.” Dispatch clarified the transport request, prompted for more information, and then ensured that the ambulance was en route. A second ambulance from Craig was also set in motion by the Colorado State Patrol regional communication center (CSP) as requested by the first ambulance.

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The truck met the first ambulance, from the small town of Maybell (population 75), near the base of the two-track and a county road. Moving the Sawyer from the truck to the ambulance went quickly. Laying on his stomach on the bed in the ambulance was much more comfortable. Unfortunately, the oxygen in the ambulance wasn’t working and neither newly arrived EMTs were qualified to put an IV-line in. Shortly though, another EMT from Maybell met the ambulance in their own vehicle and was able to get an IV started. After some confusion about the best travel route, and a few wrong turns, the ambulance was again on its way.
Figure 5: Map showing ambulance routes and rendezvous locations.

The ambulance started toward Craig at 1627 and met the second ambulance, responding from Craig, at the junction of Highway 40 and County Road 17. This ambulance was better equipped and arrived with a paramedic. The oxygen system from the Craig ambulance was used to administer oxygen to the patient and the paramedic began administering pain medications through the IV system. The Maybell ambulance EMT’s and Craig paramedic discussed whether or not to transfer their patient to the better equipped Craig ambulance for the remainder of the transport. They decided to keep him where he was and continued with the paramedic on board to Craig Memorial Hospital. The ambulance arrived at the hospital at approximately 1700.
**Figure 6**: Front and back of nomex pants worn by the Sawyer, discoloration is due to heat.

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While all this happened out in the field, a flurry of activity also occurred at the Dispatch/BLM District Office and the local Forest Service Ranger District Office where the burned Sawyer’s module was stationed. The BLM North Zone Duty Officer (Zone DO) arrived at the hospital first, shortly before the ambulance, burn protocol and injury paperwork in hand. Having been part of the conversations at the Dispatch/BLM District Office, she was alert to the concern that a burn center referral may be necessary.

After the initial notification phone call to the Sawyer’s home unit, the Acting District Ranger took the role of Hospital Liaison. His experience with the Forest Service, fire, and incident response, combined with his position and personality made him a logical person for this role. A Forest Service administrative professional accompanied him to the hospital to help with the injury paperwork, including muddling through the eSafety entry. The Hospital Liaison was not real sure what his role was going to morph into, but knew that he needed to take care of the burned Sawyer, making sure that he got the care he needed and that the paperwork was taken care of so he wouldn’t have to pay the bills. These Forest Service folks met the BLM Zone DO at the hospital and shared information about notifications, paperwork, burn injuries, and burn protocol.

* * * * *

The burned Sawyer was in a lot of pain when he arrived at the hospital, less so since the pain meds from the second ambulance kicked in. He figured that it was going to hurt, but since he had never been burned before, he didn’t know what to expect. The Saturday night on-call Doctor’s initial assessment was encouraging: they would clean him up and he would likely be released in a couple of days. It was unclear at this point if his burns met the criteria for burn center referral found in the Red Book, particularly if he had partial thickness burns (second degree) involving greater than 10% Total Body Surface Area (TBSA), or any third-degree burns. However, the Doctor assured him that he would be okay, that a burn center wouldn’t do anything differently, and that he would be walking out of there in a few days.
Initially, the Hospital Liaison was asked to leave as the nurses took care of the Sawyer. He was an outsider, with no part in the decision making. It became apparent that building relationships was going to be the first thing to focus on. Although the burned Sawyer was fine with him being there, it took several attempts on Saturday night before it was officially settled between the hospital and the Sawyer that the Hospital Liaison could be present for medical conversations. From that point on, he was included in every conversation between the Doctor and Sawyer until the Father arrived two days later.

* * * * *

Sunday morning, the Hospital Liaison began to feel strongly that a small hospital can’t provide the best care needed for burn injuries. He read it in the Red Book and received advice to continue stressing that a referral to a burn center was protocol. At this point, he still believed that the Sawyer would be released soon and would need out-patient care. Conversations at the hospital included the possibility of referral to a burn center in Denver, but focused more on releasing the Sawyer with bandages that he would be able to change daily. The burned Sawyer lived in the Forest Service bunkhouse, and concern for infection while living in a communal living space was serious. The Hospital Liaison advocated against sending the burned Sawyer home without a good plan for continued care, especially after seeing how painful the bandage changing was. He also continued to coach the Sawyer to keep asking the Doctor about a burn center referral. However, the reassurance that the Sawyer was going to be ok and that he was getting good care, pacified everyone.

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As of Monday, June 12, several discussions had taken place about whether to transport the Sawyer to a burn center. However, the Doctor was still confident that they were able to provide care commensurate with the injuries. The bandage changing procedures occurred several times per day and were described as “horrendous” by the Hospital Liaison. The gravity of the situation and the realization of a long road of recovery ahead were beginning to weigh on the Sawyer. The ever-present pain wasn’t helping either.

Monday morning, the administrative professional at the Ranger District called the Forest Service’s Human Resource Management Worker’s Compensation group (HRM WC), housed at the Albuquerque Service Center (ASC). This was the first time she was able to speak with a real person, as HRM WC is not open over the weekend. It was a surprise to realize that completing the eSafety entry was not sufficient; the CA-1 must be printed from eSafety, signed, and faxed to HRM WC to officially report an injury. This was completed and the existing medical paperwork (including the CA-16 and 17) was uploaded into eSafety. A different HRM WC employee was assigned to this case, but at this time was not contacted because all the paperwork appeared to be updated and completed.

Thanks to the assistance of the Wildland Firefighter Foundation, travel arrangements were quickly and easily made for the Sawyer’s Father to travel from Maine. He arrived at the hospital Monday evening, providing support, comfort, and advocacy for his son.

The Hospital Liaison continued to talk with the Sawyer, the nurses, and the Doctor about the importance of a referral to a burn center for out-patient care. He was concerned that if further care was needed, issues would arise within the worker’s compensation process and the ability or willingness to cover the costs of this care. By Monday evening, everyone understood that the Sawyer would be released Tuesday morning, hopefully with an out-patient burn center referral for any follow-up care.

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By Tuesday morning, the Sawyer had been in the hospital for nearly 60 hours with little change in the level of pain he was experiencing. Concerns still existed about what life would look like outside of the hospital. **Who would change the bandages? Where would this take place? How sanitary would the environment be when the wounds were exposed? If questions arose about the healing process, who would answer them?** These concerns disappeared when the Sawyer, his Father, and the Hospital Liaison met with the Doctor that morning. The Doctor decided that the best solution was to have the Sawyer transferred to the inpatient burn center at Swedish Medical Center in Denver. This was a relief to everyone.

With the referral from the Doctor and a signed order for an ambulance transport finally in hand, the burned Sawyer was ready to make the move to the burn center in Denver. Although the ambulance ride from Craig to Denver was long and quite uncomfortable, he was encouraged by his immediate impression of the facility and staff at the burn center. It was quite evident that this was a different level of care than he had experienced to this point and that he was now in the right place to receive the treatment he needed to ensure the recovery process was as quick and comfortable as possible.

The Hospital Liaison and Sawyer’s Father also made the journey to Denver on Tuesday. The next day, they were joined by a Forest Service Regional Office employee who would be transitioning into the Hospital Liaison role in Denver. The Hospital Liaisons were able to overlap during the Doctor’s rounds on Wednesday night, providing a helpful opportunity to share knowledge and experiences, as well as ask questions about the best ways to support the Sawyer and his family.

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Initial treatment at Swedish Medical Center’s burn unit included allograft surgery to clean and cover the wounds with pig skin and human donor skin. This resulted in an immense reduction in pain. It was clear to the Sawyer and his Father that the burn center had much better awareness about the complications associated with burn injuries, including pain management. This was undoubtedly superior care. However, the timeline for recovery stretched further out into the future. Ultimately, he was diagnosed by Swedish with 15% TBSA with 10% third degree burns to bilateral lower extremities, a diagnosis that clearly met the burn protocol’s triggers for a referral to a burn center.

Ten days after the initial burn, and seven days after admittance to the burn center, a second allograft surgery to clean the wounds and replace the pig/donor skin occurred. Two days later, the burned Sawyer was released from Swedish Burn Center, but required to stay in Denver for continued outpatient care. A third surgery, this time an autograft which grafted some his own tissue onto his burns, occurred another week later on Tuesday, June 27th and required an overnight stay.

On Monday, June 26th, a field nurse was assigned by the Department of Labor’s Office of Worker’s Compensation Programs (DOL OWCP). Even though the liaison wasn’t even sure who this was or how this worked, the field nurse proved to be a huge asset. Finally someone who knew the paperwork requirements and was able to locate an approved physical therapist. By Wednesday, June 28th, a new case manager at HRM-WC was also assigned who was very helpful in working though administrative processes associated with light duty work.

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The story continues for the burned Sawyer. On July 17th he was released for light duty and will continue physical therapy and regular checkups at the burn center. However, the likelihood that he will return to firefighting duties this season is low. Some questions still remain: How will his
healing process go? How long will he be on light duty? Will all the efforts to get his paperwork in-line be successful with the US Department of Labor’s Office of Worker’s Compensation Programs (DOL OWCP)?

![Image of chaps showing areas of heat damage]

**Figure 7:** Chaps worn by the Sawyer showing areas of heat damage.

**SUCCESSES**

**Taking Care of Our Own**

Although a firefighter was burned, many good things happened to minimize the stress and strain on those who were heavily impacted either directly or indirectly. It is very encouraging to see the strides wildland fire agencies are making when it comes to truly “taking care of our own” such as immediate EMT care, quick evacuation, hospital liaison, family travel, quality of care, administrative support, and crew support.
Fuel Geysering Awareness
Although this was not a fuel geysering event, the injured firefighter was familiar with the fuel geysering issue and exercised caution pertaining to fuel geysering and chainsaw refueling. The firefighter observed signs of the chainsaw vapor locking when it quit running and wouldn’t restart. He decided to check the fuel, but moved away from the burning material to an unburned area to open the cap.

Close Proximity of Qualified EMT’s
The Module had three qualified Basic EMT’s on the fire that day, two of which were able to respond nearly immediately to begin assessing the injuries and providing treatment. Although EMT is not a required qualification for any positions on the Module, the employees had pursued the required training to stay current on this qualification. The Module has encouraged these employees to maintain the certification and has arranged for training, in some cases arranging to pay the salary, tuition, and travel costs for training as well as the purchase of needed medical supplies. The District supported this training as well by approving the expenditures.

Incident within an Incident
An Incident Commander for the medical incident was quickly designated and communicated to dispatch. Quickly assigning command of the incident to one individual allowed others to fall into the necessary support functions and ensured clear communications with the dispatch center to ensure a rapid and smooth medical response and transport to a hospital.

Evacuation Plan
The evacuation plan was sound and included redundancy to ensure that in the event of a delay another form of evacuation would be available. When discussing transportation options, the Incident Commander of the Incident within an Incident considered transport times, patient needs, and contingencies. The incident helicopter was asked to configure for patient transport and began that process. The closest ground ambulance was dispatched to the fire from Maybell, CO. This ambulance also requested that a ground ambulance be dispatched from Craig, CO with increased treatment capabilities, such as the availability of a paramedic to administer pain medications.

Hospital Liaison and Support Personnel
Two different liaisons provided valuable support to the injured employee during his time in the hospital and burn center.

Referral to a Burn Center
The patient was transported to a burn center approximately 60 hours after admittance to the local hospital to receive the necessary follow-up treatment for the burn injuries. The level of care received at the burn center was top notch. Pain management and patient comfort level improved greatly at the burn center.

Family Travel
The patient’s father was able to make travel arrangements to get to the hospital quickly and at minimal financial burden to the family. The Wildland Firefighter Foundation (WFF) was able to pay for the necessary flights, rental car, and initial hotel rooms to ensure there was no delay in getting the father where he needed to be. Once at the burn center, the Forest Service was able to use invitational travel to pay for travel and per diem expenses for the father to stay near the hospital.
LESSONS LEARNED

The Temple Burn Injury review was conducted by the US Forest Service and the Bureau of Land Management as a joint Facilitated Learning Analysis process. Because of this, recommendations for improvement are included as allowed for in Chapter 18 of the Interagency Standards for Fire and Fire Aviation Operations (Red Book) and page 49 of the 2016 FLA Guide. These recommendations aim for systemic improvements to the way both Agencies respond to burn injuries to Wildland Firefighters. The BLM Fire and Aviation Directorate, in partnership with the BLM Colorado State Office will be responsible for implementation and follow-through of these recommendations.

Burn Protocol

In Chapter 7 of the Red Book, the section labeled “Required Treatment for Burn Injuries” lists the standards to be used when any firefighter sustains burn injuries, regardless of agency jurisdiction. From the initial report of a burn injury, until the eventual referral to a burn center, interagency personnel struggled to interpret and implement the listed standards. Particularly difficult areas to navigate included the initial assessment and the role of the agency once an employee was under the care of a medical provider.

During the initial assessment of this incident, the EMTs on-site used the Medical Incident Report, more commonly referred to as the 9-Line, on pages 108 and 109 of the Incident Response Pocket Guide (IRPG) to gather burn injury information to relay to dispatch. Both the EMTs and Dispatchers commented that the order of the information in the 9-Line could be improved by moving the transport priority information to one of the first items relayed. The National Wildfire Coordinating Group’s (NWCG) Incident Emergency Medical Subcommittee is currently working on a revision of the 9-Line. The updated version to be included in the IRPG will put the most pertinent and time sensitive information towards the top and will look more like a fire size-up. Although no release date is scheduled, this new version could be available in 2018.

Also during initial assessment, discrepancies were noted in how the IRPG and the Red Book discuss burn severity. Page 108 of the IRPG guided the EMTs to determine the severity of injury and transport priority by estimating the size of second or third-degree burns using the palm of the hand. The Rule of Palms is a method to estimate the percentage of Total Body Surface Area burned (TBSA). Based on their first-hand observation of the burns, the EMT’s priority and focus quickly became getting the burned Sawyer to the hospital. A precise estimate of TBSA was not a big concern for them at this point.

At the same time, agency personnel at Dispatch used the Red Book as a guide to determine if referral to a burn center was “required.” The Red Book uses the Rule of Nines to estimate the TBSA using the following graphic depiction from page 173. These folks were listening to the radio traffic for trigger words such as 10% or third-degree, but never heard them. Although both techniques, the Rule of Palms and the Rule of Nines, ultimately result in an estimation of the TSBA, personnel on both ends of the radio should be aware of these differences in order to minimize potential confusion.
4. SEVERITY OF EMERGENCY, TRANSPORT PRIORITY

SEVERITY
- URGENT-RED Life threatening injury or illness.
  Ex: Unconscious, difficulty breathing, bleeding severely, 2°-3° burns more than 4 palm sizes, heat stroke, disoriented.

PRIORITY-YELLOW
- Serious injury or illness. Ex: Significant trauma, not able to walk, 2°-3° burns not more than 1-2 palm sizes

- ROUTINE-GREEN
- Not a life threatening injury or illness. Ex: Sprains, strains, minor heat-related illness

TRANSPORT PRIORITY
- Ambulance or MEDEVAC helicopter. Evacuation need is IMMEDIATE.
- Ambulance or consider air transport if at remote location. Evacuation may be DELAYED.
- Non-Emergency. Evacuation considered Routine of Convenience.

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**Figure 8:** Excerpts from the IRPG and Red Book showing two ways to estimate TSBA.

<table>
<thead>
<tr>
<th>American Burn Association Burn Injury Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017 Red Book, pg. 172</td>
</tr>
<tr>
<td>• Partial thickness burns (second degree) involving greater than 10% Total Body Surface Area (TBSA).</td>
</tr>
<tr>
<td>• Burns (second degree) involving the face, hands, foot, genitalia, perineum, or major joints.</td>
</tr>
<tr>
<td>• Third-degree burns of any size are present.</td>
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<tr>
<td>• Electrical burns, including lightning injury, or chemical burns are present.</td>
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<tr>
<td>• Inhalation injury is suspected.</td>
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<tr>
<td>• Burn injury in someone with preexisting medical disorders that could complicate management, prolong recovery or affect mortality (e.g., diabetes).</td>
</tr>
<tr>
<td>• Any patient with burns and concomitant trauma (such as fractures) in which the burn injury poses the greatest risk of morbidity or mortality. In such cases, if the trauma poses the greater immediate risk, the patient may be initially stabilized in a trauma center before being transferred to a burn unit. Physician judgment will be necessary in such situations and should be in concert with the regional medical control plan and triage protocols.</td>
</tr>
</tbody>
</table>

**Figure 9:** Excerpt from the Red Book showing American Burn Association Burn Injury Criteria

Understanding the role of an agency administrator or hospital liaison in influencing a referral to a burn center was also a difficult area to navigate. The burn protocol in the Red Book goes on to state that if a firefighter meets one of the above criteria, the Agency Administrator or designee should discuss and coordinate with the attending physician to ensure that the patient is appropriately referred to the nearest regional burn center. An agency representative has no legal authority over the patient’s care; their role is limited to advocacy. Ensuring that a firefighter whose burn injuries meet any of the following burn injury criteria is appropriately referred to the nearest regional burn center can be difficult considering the agency cannot request a transfer to a specialty care physician/facility, this decision is made only by the attending physician. The patient does have the right to request a referral or a consultation, however workers compensation benefits may be denied in the event the employee is transported to a specialty care physician/facility without a referral from the attending physician after already being seen by a medical provider. If the medical provider will not do this and the burn meets the referral criteria, then ask for documentation why they will not refer the employee.

Even though there were a lot of questions concerning the burn protocol, it still served as a valuable tool to initiate questions with the medical providers. A copy of the protocol was presented to both the
emergency room physician and the attending physician. Additionally, the liaison used the protocol to coach the employee and his family so they could advocate for themselves.

Another lesson learned was that the list of regional burn centers accessed through the Red Book is not an exhaustive list. Swedish Medical Center, where the Sawyer was ultimately referred and treated, was not listed on the Dispatch Center’s regional burn center list. The link in the Red Book for a list of burn care facilities (http://www.ameriburn.org/verification_verifiedcenters.php) directs you to the American Burn Association (ABA) verification webpage. From there, you can search for the location of verified burn centers in the US. These verified centers meet specific criteria of the ABA, however, additional burn centers also exist. Consultation with the attending physician and health care facility as well as DOL - OWCP will determine which burn center is chosen.

Finally, the Dispatch Center learned that the burn protocol listed in NWCG’s memo NWCG#012-2008 from July 10, 2008 regarding Standards for Burn Injuries does not match current direction found in the 2017 Red Book. The Dispatch Center used the 2008 memo to update their 2017 Field Operations Guide and did not realize that the burn injury criteria had been updated in the 2017 Red Book.

**Burn Injury Criteria in 2008 NWCG Memo**

- Partial thickness burns (second degree) involving greater than 5% Total Body Surface Area (TBSA).
- Burns (second degree) involving the face, hands, feet, genitalia, perineum, or major joints.
- Third-degree burns of any size are present.
- Electrical burns, including lightning injury are present.
- Inhalation injury is suspected.
- Burns are accompanied by traumatic injury (such as fractures).
- Individuals are unable to immediately return to full duty.
- When there is any doubt as to the severity of the burn injury, the recommended action should be to facilitate the immediate referral and transport of the firefighter to the nearest burn center.

**Recommendations:**

1. The NWCG Incident Emergency Medical Subcommittee should consider bringing the IRPG and Red Book into alignment for determining TBSA.
2. The BLM and Forest Service representatives on the NWCG Risk Management Committee should explore inconsistencies and grey areas within the burn protocol and bring them forward to the Committee. Consider revisions to the 2018 Redbook and other documents to address the confusion between the multiple burn injury documents, and provide AA’s with clarification on their authority to request a transfer to a burn center, and work with OWCP to get updated information on higher level of care.

**Family/Hospital Liaison Role**

Over the course of the injured employee’s hospital stays, two Forest Service employees performed in the role of liaison, one at the hospital in Craig, and another at the burn center in Denver. Both of these individuals provided considerable value to the injured employee and his family in terms of morale, coordination, advocacy and negotiating unfamiliar and confusing bureaucratic processes.

The initial liaison was clear that he was there as an advocate for the injured employee. His first concern was for the employee and the care that he received. He was familiar with burn protocol and from the
moment he arrived at the Craig hospital he actively worked to share this information with the hospital staff and the injured employee. The liaison was in a weird spot when it came to making decisions about medical care because he really didn’t have any legal right. Without purposeful and intentional relationship building, he would have remained outside of the triangle of the patient, the family, and the Doctor. He stated, “There isn’t a script for this. There’s no button to push. It’s fluid. It’s about figuring it out, person to person.” He kept in close communication with the patient and hospital staff, attending every consultation. He also spoke regularly with interagency partners and administrators who were also keenly concerned that the injured employee receive the appropriate care.

Initially, the Doctor was confident that the hospital was the appropriate facility and that the injured employee would be released in a couple days. When it came to a burn center referral, it quickly became apparent that the liaison couldn’t go any further than suggesting...he couldn’t demand...he couldn’t stomp his foot. Even though he tried to follow the Red Book burn protocol, he realized that it was not implementable, it should be written more like lessons learned or suggestions rather than direction; it’s the Doctor’s call and the agency cannot dictate our own policy to the Doctor. The liaison continued to advocate for a referral for specialized burn care and coached the injured employee to advocate for himself. Over the course of the next two days, the Doctor’s stance eventually changed and he agreed to make a burn center referral. Most of the people involved in this incident believe that the burn center referral should have come sooner, but it is unclear if the delay had adverse impacts on the injuries.

Influenced by past experience, the second concern of the initial liaison was that the worker’s compensation paperwork be completed appropriately so that the employee wouldn’t be asked to pay bills in the future. He arranged for help with the entry of the injury in to the Forest Service’s eSafety database. He worked diligently to ensure that he had copies of medical information and that all forms were signed by the Doctor, not a Physicians’ Assistant as noted in the Red Book and required by the DOL OWCP. He made sure to get a signed Doctor’s script for the ambulance transportation to the burn center as well. Getting signed copies of forms took proactive and direct communication with the Doctor and hospital staff.

One big lesson learned from the perspective of the initial liaison was that there was no expert available to coach him in his role as a liaison. Even though he was being told that he was doing a good job, he didn’t have any way to know if he was doing everything possible to help the burned employee. How will he really know if he did a good job until months down the road when the employee is back at work and the medical bills are all paid? No one could answer the tough questions, especially when it came to the worker’s compensation process and dealing with burn injuries. People at the tip of the spear need an expert who is well versed in the nitty gritty, someone to call with difficult and detailed questions, even on weekends or after normal business hours.

Resources for Liaisons

Recommendation:
3. The BLM and Forest Service representatives on the NWCG Operations and Training Committee should encourage the Working Group to bring the Family and Hospital Liaisons course into the NWCG national training curriculum.
Worker’s Compensation Process
The worker’s compensation process was described as a big black box that is wonky and unclear. The role of case managers assigned through the Forest Service Human Resource Management Worker’s Compensation (HRM WC) group at the Albuquerque Service Center (ASC) was also unclear. Differences between the availability of advice and help for the Forest Service and BLM were also noted.

Most employees don’t have much experience dealing with the injured worker compensation process and timely expertise was not readily available for the Forest Service employees who were actively trying to get it right. On Saturday night, the injury was entered into eSafety, but HRM WC was closed until Monday. The initial hospital liaison called a number of his personal and professional contacts for advice, but was unable to get the detailed advice that he was searching for. When HRM WC was finally contacted on Monday morning, it was actually a surprise that the eSafety entry wasn’t sufficient for reporting the injury. To officially report an injury, the CA-1 must be printed from eSafety, signed, and faxed to HRM WC and the existing medical paperwork (including the CA-16 and CA-17) must be uploaded into eSafety. At this point, a HRM WC case manager was assigned, who wanted to be informed, but did not provide very valuable information to the second hospital liaison and the injured employee. The case was elevated to a different HRM WC case manager on July 28th, 18 days and three surgeries later. If the HRM WC case manager’s role is to advocate for the patient and to liaise with the DOL OWCP, it did not appear to have happened in a timely manner. When a field nurse was assigned by the DOL OWCP on June 26th, the second hospital liaison finally felt like they had timely access to an expert who understood the worker’s compensation process and who had current information about the Sawyer’s specific case.

In contrast to the Forest Service’s process, the BLM Colorado State Office has a designated worker’s compensation expert available 24-7 and the BLM has accident report packets available to all employees that contain detailed, agency specific guidance for employees injured on the job as well as copies of commonly needed Department of Labor forms such as the CA-16, CA-17. Forms from this packet were actually used in this incident and submitted to the HRM WC for the Forest Service.

Resources
  http://fsweb.asc.fs.fed.us/HRM/owcp/WCDocuments/RevisedWCRespFieldSup.pdf

Family Travel
The patient’s father was able to make travel arrangements to get to the hospital quickly and at minimal financial burden to the family. The Wildland Fire Foundation was able to pay for the necessary flights, rental car, and initial hotel rooms to ensure there was no delay in getting the father where he needed to be. This process was described as very smooth. Once at the burn center, the Forest Service was able to navigate the necessary administrative processes to pay for travel and per diem for the father near the hospital.

The United States Forest Service (USFS) policy for family member travel and per diem is clearly stated in Chapter 30 of the Forest Service Death and Serious Injury Handbook. It states that “When an employee is seriously injured on the job (including while in travel status), or suffers a medical emergency in travel status, the Deputy Chief, Regional Forester, Station Director, Area Director, or Special Agent in Charge, or their designated acting, may request the use of appropriated funds, on a case-by-case basis, to pay for travel expenses for 3, or fewer, immediate family members to travel to the location where the employee
is receiving medical treatment.” Authority: 41 CFR 301-1.3a; 5 U.S.C. 4503; Comptroller General Decision B-270446, Feb. 11, 1997

Emergency family member travel follows the standard invitational travel process, but it requires additional documentation, the Invitational Family Travel Analysis. This process is also described in detail in Chapter 30 of the Forest Service Death and Serious Injury Handbook.

However throughout the review process it was not as clear if the Bureau of Land Management (BLM) had the authority to pay for travel and per diem of a family member. After many calls it was determined that the BLM cannot pay for the travel and/or per diem of a seriously injured employee’s family member. Most of the information on BLM travel is addressed in The Federal Travel Regulations (FTR) and it does not give any authority to pay for family travel.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Transport of Sick/Injured, When in Travel Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agency</td>
<td>BLM</td>
</tr>
<tr>
<td>Reference</td>
<td>Federal Travel Regulations chapter 300</td>
</tr>
<tr>
<td>Funding</td>
<td>Expenditures charged to the program in which the victim was working at the time of the incident. For wildland fire, charge to the specific incident fire code.</td>
</tr>
<tr>
<td>BLM and FS Regular Employees (Including Temporaries)</td>
<td>Yes. (No authority to pay for family members.)</td>
</tr>
<tr>
<td>Casual Employees</td>
<td>Yes. (No authority to pay for family members.)</td>
</tr>
<tr>
<td>Contractors</td>
<td>No. Covered by the contractor.</td>
</tr>
<tr>
<td>Federal Cooperators</td>
<td>Refer to employing agency of victim.</td>
</tr>
<tr>
<td>State/Other Government Cooperators</td>
<td>No. Covered by employing organization.</td>
</tr>
</tbody>
</table>

**Figure 10:** Information taken from page 4 of the You Will Not Stand Alone BLM Desk Guide 2016

**Resources for Family Travel**

- Forest Service Death and Serious Injury Handbook  
- BLM Line of Duty Death Guide  
  [https://www.nifc.gov/training/LODD/BLM_LODD.pdf](https://www.nifc.gov/training/LODD/BLM_LODD.pdf)

**Recommendation**

4. The BLM should pursue using the following authority to support family travel with in the BLM: **Authority: 41 CFR 301-1.3a; 5 U.S.C. 4503; Comptroller General Decision B-270446, Feb. 11, 1997.**

**Patient’s Rights**

Understanding patient’s rights and the scope of authority for hospital liaisons or other agency representatives can help facilitate the proper care. Prior to arriving at the hospital, an agency has some
role in deciding medical care including 1st aid, transportation method, and potential location of emergency care. After an employee is under the care of a physician, an agency representative has no right to make medical decisions. An agency representative may be isolated to a role of advocacy. Advising the hospital staff of agency guidelines or standard procedures may help facilitate a referral to a burn center or other specialty care. If family members are present, informing them of their options and applicable agency policy may empower them and help influence the physician referral. An agency representative may coach the patient on their rights or on what to say to the doctor. They may also coach the family on what to say and do. The agency may receive medical information, subject to the patient’s consent.

If the patient is mentally capable (medical condition and medications can impact decision making), they are the one driving medical decisions and they have expansive authority over choosing their method of care as limited by worker’s compensation rules. A patient is able to request transfer to another facility at any time, but the patient has to be medically stable and there has to be an accepting physician at the receiving facility. If the current medical provider does not agree with the transfer, then they are not obligated to obtain an accepting physician at the receiving facility nor give the referral to another medical provider, which impacts the worker’s compensation coverage.

Tips for Advocating for Your Rights as a Burn Patient

1. The patient has a right to be seen by any doctor they choose, however the type of doctor needs to be appropriate – not a family doctor for a fractured extremity or large burn, and they need to be sure the doctor accepts FEDERAL Worker’s Compensation claims or they may be responsible for paying the bill. Emergency rooms are the best choice for emergency medical care as they are required to provide treatment even without advance guarantee of payment.

2. The patient, family or agency, if the patient is unconscious or not able to be part of the conversation due to head injury effects or not able to concentrate because of pain, can request a referral to a burn center or a teleconsultation with a burn center. If this request is not accepted, the patient, family, or agency can ask for documentation as to why a doctor will not refer them to a burn center or provide a teleconsultation with a burn center.

3. The patient or family is able to request transfer to another facility at any time, but the patient has to be medically stable and there has to be an accepting physician at the receiving facility. If the current medical provider does not agree with the transfer, then they are not obligated to obtain an accepting physician at the receiving facility nor give the referral to another medical provider, thus it would not be covered by worker’s compensation. It is then, in this situation, up to the patient or family to find an accepting physician at the receiving facility. The only time the stability issue does not apply is if the current hospital does not have the capabilities to stabilize the patient.

4. The patient or family can ask for an explanation if they don’t understand why something is or is not being done.

LESSONS REVISITED

Fuel Cap Failures
There are numerous known instances of fuel cap failures on wildland fire incidents. Some saws may have had damaged caps while other incidents may have occurred from improperly sealed or seated caps. A BLM IA Squad and a BLM engine each reported having fuel cap issues on the Temple Fire on the same day. Both of these fuel caps were replaced with spares. For more information on previous fuel
cap related issues please see the attached links. Visually checking the fuel level before opening a fuel cap is recommended by the National Fuel Geyser Awareness campaign.

- **Rock Ridge Burn Injury Accident Investigation**, 2014 (14 pages) “A county firefighter received severe burns to the forearms and legs while operating a chainsaw around the perimeter of the fire. The chainsaw was found at the incident site with the fuel cap off and the tank empty. Witnesses saw the fire ignite at ground level and then engulf the firefighter.”
- **RX_Fuel_Cap_Near_Miss_RLS.pdf**, 2016 (4 pages) While no burn injuries occurred on this recent Near Miss, the sawyer’s boots and chaps did catch fire. This story provides a good head’s up.
- **Safety Warning**, 2014 (1 page) Stihl Chainsaw Fuel/Oil Caps.

**Burn Injuries from Fuel + Fire**

Injuries caused by fuel on clothing igniting near open flame have occurred many times in the past. This incident shows again that stop, drop and roll doesn’t readily extinguish fires involving fuel and clothing, water works better. Undergarments of natural or flame-resistant materials will minimize burn injuries: do not wear synthetic fabrics that could melt. Additionally, burn gel is appropriate for small burns that will not need to go to the hospital, otherwise, NO BURN GEL should be applied. Burn center standard guidance is to cool the burn as quickly as possible. If the burn is excessively dirty, lightly clean it and cover it with a clean cloth and transfer to the hospital.

The following lessons each discuss a firefighter burned due to exposure to fuel and fire.

- **NWCG Risk Management Committee Memo No 17-002, 1 May 2017, Drip Torch and Burn Injuries:**
  

- **Dangers of Fuel Rapid Lesson Sharing, 12 June 2015, 14 incidents involving fuel igniting between 2010-2015:**
  
  http://www.wildfirelessons.net/HigherLogic/System/DownloadDocumentFile.ashx?DocumentFileKey=79956a3d-12f0-4b85-a892-10c2a1ef084e&forceDialog=0

- **Aragon Fire Rapid Lesson Sharing**
- **Homestead Fire 72 Hour Report**
- **Logging Slash Fire Report**
- **Oak Mesa Fire Lessons Learned Review**
- **Pioneer Fire Lessons Learned Review**
- **Pingree Hill Prescribed Fire Burn Injury**
- **Willow Peak Fire Facilitated Learning Analysis**
- **Yellow Jacket Prescribed Fire Rapid Lesson Sharing**

**References for safer chainsaw operations**

- **2017 NTDP Fuel Geysering: Predictable? Video**
- **National Fuel Geyser Awareness website**
- **NIFC Chainsaw Safety Video**
- **WFSTAR Fireline Fuel Safety Video**
- **NMAC Chainsaw Operations, Fuel Handling, and Safety Letter0**
APPENDIX A - PERSONAL PROTECTIVE EQUIPMENT REPORT

Temple Fire – Chainsaw Fuel Burn Injury PPE Report – National Technology and Development Program

The Swamper heard shouts and turned around. He saw the Sawyer on fire, fumbling to get the chainsaw chaps straps unbuckled. The Sawyer unbuckled the waist belt and top leg straps, the Swamper yelled to drop and roll. The Sawyer rolled back and forth then stood back up, the bottom of the chaps still burning. The Swamper retrieved a water bottle, ran to the Sawyer and poured it on the flames finally extinguishing them. The Sawyer was on fire between 30 and 60 seconds.

Flame-Resistant Pants

- Flame-resistant Pants: Forest Service Specification 5100-92
- Fabric: Meta-aramid blend (Nomex IIIA)
- Compliant to NFPA 1977 standard
- Manufactured: 2001
- Condition: Fabric scorch and dye sublimation can be seen mostly on the back left leg, back upper right leg and buttocks areas. The buttocks area has a small area of fabric char. Cotton underwear briefs show no heat damage.

![Figure 1: Back of Pants](Image1)

![Figure 2: Front of Pants](Image2)

Flame-Resistant Shirt

- Flame-resistant Shirt: Forest Service Specification 5100-91
- Fabric: Meta-aramid blend (Nomex IIIA)
- Compliant to NFPA 1977 standard
- Manufactured: 1998
- Condition: Dye sublimation and char are present on the lower left side on both the front and back of the shirt. The loop fastener on the left sleeve cuff shows melt.
Figure 3: Shirt – Front

Figure 4: Shirt – Front

Figure 5: Shirt – Back

Figure 6: Chaps

Figure 7: Chaps Tool Pouch

Chaps
- Chainsaw Chaps: Forest Service Specification 6170-4G
- Compliant to NFPA 1977 standard
- Condition: Nylon cloth and webbing show areas that have been melted, mostly on the exposed edges of the left leg.

Discussion:
The U.S. Forest Service, National Technology and Development Program (NTDP) conducted experiments in attempt to simulate the accident. The pants from this accident appear similar to test burns with saw gas that lasted between 30 and 60 seconds.

Dye Sublimation: When the cloth reaches 450 F, the heat “bakes” the dye out of the cloth; green meta-aramid cloth changes to an orange color.

Burn Injury: The second and third degree burns were on the lower extremities, mostly to the left leg.

<table>
<thead>
<tr>
<th>Item conditions and corresponding temperatures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel Flame</td>
</tr>
<tr>
<td>Meta-aramid Cloth – char</td>
</tr>
<tr>
<td>Chainsaw Chap Nylon Cloth – melt</td>
</tr>
<tr>
<td>Meta-aramid Cloth – dye sublimation</td>
</tr>
<tr>
<td>Human Skin – 2nd Degree Blister</td>
</tr>
</tbody>
</table>
Reminders

- The direct flame contact associated with fuel will burn no matter the substrate on which it lands and the heat produced by its flame will conduct through fabric. The flame resistant fabric provides some protection, but burn injury can be expected.

- “Stop, drop and roll” does not readily extinguish a fuel/FR clothing fire. Loose dirt and water can be most effective at extinguishing these types of fires. In addition, dropping burning pants down to the ankles can reduce flames and separate them from skin.

- The Red Book requires wearing undergarments of natural fibers (cotton, wool or silk) or flame resistant fabric instead of synthetic. The cotton briefs worn lessened the burn injury. Synthetic material would have likely melted and contributed to burn injury.