Workplace First-Aid Kits

Aligning Hardware With Hazards

By Scott Gunderson and Cameron Helikson

Incident and injury prevention is the proper focus for SH&E professionals, but emergency preparedness for events ranging from individual incidents to large-scale disasters remains an important skill and activity (Mitzel, 2007; Schroll, 2002). Even the safest workplace can see any number of nonoccupational medical emergencies, such as heart attack, stroke, seizure and diabetic emergency, because employees bring their personal medical conditions to work. Consequently, medical response represents a bedrock issue for any workplace emergency response program.

This article addresses the issue of workplace first-aid kits as a critical element of an emergency response program, with attention to specific hazards that drive selection of specific hardware beyond the minimum recommended by OSHA and ANSI. Hardware such as oxygen for respiratory emergencies, tourniquets and hemostatic agents for bleeding and shock, and spinal immobilization equipment for severe head, neck and back trauma are not included in ANSI/ISEA Z308.1, which specifies minimum requirements for workplace first-aid kits and supplies.

Much of this hardware is readily available and, in the case of hemostatic agents for controlling blood loss, is aggressively marketed to consumers. Employees seeing such marketing and advocating purchase may not be aware of the liabilities associated with use of such hardware in the workplace. SH&E professionals need to be aware of requirements, such as training and medical direction, before adding some of this hardware to workplace first-aid kits.

Because this article focuses on first-aid kits based on workplace hazards, resources for sudden cardiac arrest such as automated external defibrillators (AEDs) are not extensively covered, nor are issues such as recent changes in cardiopulmonary resuscitation (CPR). Those topics have received much coverage elsewhere (Berg, Hemphill, Abella, et al., 2010; Field, Hazinski; Sayre, et al., 2010; Link, Atkins, Passman, et al., 2010; Travers, Rea, Bobrow, et al., 2010).

Scott Gunderson, CSP, CHMM, EMT-B, is EHS specialist at Tosoh Quartz in Portland, OR. He holds a B.A. in English from Western Oregon University, an M.A. in English from Portland State University and an M.Eng. in Systems Engineering from Portland State University. An Oregon emergency medical technician-basic (EMT-B), he also is an American Red Cross and American Heart Association first-aid/CPR/AED instructor. Gunderson has published articles in *Systems Engineering* and *Journal of System Safety*. He is a professional member of ASSE's Columbia-Willamette Chapter.

Cameron Helikson, EMT-I, is EHS engineer at TriQuint Semiconductor, in Hillsboro, OR. He holds a B.S. in Business from Portland State University. He has established workplace emergency medical response teams at several different sites. Helikson has been a volunteer EMT-Intermediate and firefighter for the Newberg Fire Department for 17 years. He has been a CPR/first-aid instructor for American Red Cross and National Safety Council, and also is a basic life support/Heartsaver instructor for American Heart Association. Helikson is a professional member of ASSE's Columbia-Willamette Chapter.

OSHA Rules for Medical Services & First Aid

For a subject with life and death implications, OSHA 29 CFR 1910.151 for medical services and first-aid is brief. Its three sections cover ready availability of medical personnel, first-aid training, and emergency eyewash and showers. What this short standard lacks in detail or prescriptive requirements, it makes up for in flexibility, especially with first-aid kits, which are covered in a nonmandatory appendix that is longer than the standard itself.

Both the appendix and a supplemental publication (OSHA 3317-06N) emphasize two major points: a recommended minimum set of first-aid supplies and criteria for expanding supplies beyond this minimum set. The appendix identifies the 1998 revision of ANSI/ISEA Z308.1 as describing the minimum level of supplies for a workplace first-aid kit. That list consists of just eight lines:

1) 1 each absorbent compress 32 sq. in. no side smaller than 4 in.
2) 16 each adhesive bandages 1 x 3 in.
3) 1 each adhesive tape ⅜ in. x 2.5 yd.
4) 10 each antiseptic 0.14 fl. oz. (0.5 g).
5) 6 each burn treatment 1/32 oz. (0.9 g).
6) 2 pair medical exam gloves.
7) 4 each sterile pad 3 x 3 in.
8) 1 each triangular bandage 40 x 40 x 56 in.

The standard was revised in 2009, with a modest addition of two lines: 6 each antibiotic treatment 0.14 fl. oz. (0.5 g) and 1 each first-aid guide.

Clearly, the minimum level specified by ANSI/ISEA is not adequate for serious emergencies such as major bleeding or fractures. Both OSHA and ANSI/ISEA acknowledge this and recommend expanding first-aid kits based on hazards in a given workplace, which can be determined by reviewing historical incident and injury data, as well as by consulting with qualified medical professionals. Analyzing how employees, contractors and visitors have been injured, how they could be injured and how the organization is able to respond can inform efforts to expand workplace first-aid kits beyond the minimum prescribed items to levels with potential to support a life-saving response.

Employee Training & Qualifications

In many cases, selecting first-aid supplies may first require an understanding of employee qualifications. For example, a first-aid card does not qualify an employee to apply stitches, and failure to limit supplies to the levels of employee qualifications may endanger injured employees and expose an organization to liability. Qualifications to provide care begin at the "lay responder" first-aid level, progress through multiple levels of emergency medical technician (EMT), and peak at nurses and physicians (Table 1, p. 44).

Determining the level of training requires determining the need for training, which is driven by availability or not of medical personnel. OSHA requires employee first-aid training in the absence of professional medical care such as a hospital in near proximity, which the standard does not define. A 2007 letter of interpretation provides clarification by defining *near proximity* in terms of response time: 3 to 4 minutes (OSHA, 2007). The purpose for this short time is the physiological reality that death is likely with longer response times in emergencies such as sudden cardiac arrest, asphyxiation and severe bleeding.

Employers that forgo first-aid training for employees and instead rely on emergency medical services (EMS) by calling 9-1-1 or another local/regional emergency notification number may not meet the near proximity interpretation for readily available medical person-

IN BRIEF

- **Workplace first-aid kits are an important component of an occupational emergency response program, but kits that simply meet minimum standards do not contain adequate supplies for life-threatening emergencies.**
- **Both OSHA and ANSI recommend expanding first-aid kits with supplemental emergency medical supplies.**
- **Many supplies are readily available and some are aggressively marketed on the Internet, but employers must use caution during selection because hardware is tightly coupled with employee training and qualifications.**
- **Employers must ensure that hardware is appropriate for both the work environment and for the training and qualifications of employees who will be expected to use it.**

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Portable first-aid kits are ideal for carrying to unconscious or immobile victims. In addition to minimum supplies per ANSI/ISEA, this kit includes materials for bloodborne pathogen exposure prevention: eye/face protection and four bags of gloves with a dozen pairs each in sizes small, medium, large and extra large. Kit also includes significant amounts of gauze and other materials for direct pressure to control serious blood loss in a machine-heavy industrial workplace. No hardware in this kit requires training beyond the lay responder level.

Table 1

Prehospital Care Provider Summary of Scope of Practice

Level	Summary of scope of practice (may vary by state)
Emergency medical responder	Airway management including oxygen delivery, suction and simple airway adjuncts; unit dose autoinjectors; manual stabilization of cervical spine injuries and extremity fractures; bleeding control; emergency patient moves.
Emergency medical technician	Includes above scope; airway management including nasopharyngeal adjuncts; assisting patients with their medications; oral glucose; aspirin; application of pneumatic antishock garment; patient transportation.
Advanced emergency medical technician	Includes above scope; airway management excluding tracheal intubation; intravenous access and nonmedicated intravenous fluid therapy; additional pharmacological interventions.
Paramedic	Includes above scope; airway management including tracheal intubation and needle-puncture access; pharmacological interventions including intravenous medication; advanced cardiac life support including manual defibrillation.

Note. *From National EMS scope of practice model, by National Highway Traffic Safety Administration, 2006, Washington, DC: U.S. DOT.*

Qualifications to provide care begin at the lay responder first-aid level, progress through multiple levels of emergency medical technician, and peak at nurses and physicians.

nel, even in well-populated and well-served urban or suburban areas. For example, two audits 12 years apart in the Portland, OR, area, revealed average response times between 5 and 7 minutes, outside the near proximity window for a life-saving response to serious medical emergencies (City of Portland, 1998; 2010).

The lay responder, also known as a first-aid card holder, represents the lowest level of first-aid training. International Liaison Committee on Resuscitation, American Heart Association and American Red Cross cosponsor and recommend first-aid guidelines for lay responders (Markenson, Ferguson, Chameides, et al., 2010). ASTM F2171 outlines limitations for lay responders with emphasis on occupational settings and makes clear that industry-specific response expectations require specific training.

Individuals with first-aid/CPR/AED cards from organizations such as American Heart Association or American Red Cross are not licensed healthcare professionals. With just 2 to 4 hours of training time, depending on the instructor and agency, they are trained to perform simple tasks such as applying direct pressure for bleeding. With this limited amount of training, the authors question how much a lay responder typically remembers. Based on observations during several workplace emergencies, the authors believe that how an employee responds is as much a function of personality as training.

EMTs are prehospital care providers who are licensed or certified by their state. They can provide a higher level of care than a lay responder. Starting at first responder (soon to be renamed emergency medical responder) and moving up to the level of paramedic, with many variations across states, prehospital care providers operate under a defined scope of practice, which is "a legal description of the distinction between licensed healthcare personnel and the lay public" and "includes technical skills that, if done improperly, represent a significant hazard to the patient and therefore must be kept out of the hands of the untrained" (NHTSA, 2006a).

Allowing employees to respond as prehospital care providers is not as simple as allowing employees with first-aid cards to respond as lay responders. An organization would need to provide or sponsor initial and refresher training, ranging from 48 to 56 initial hours for emergency medical responders to 1,200 initial hours for paramedics. Recertification hours vary widely among states (NHTSA, 2006b, Appendix A). An organization also would need to follow state-specific laws that address medical direction, quality review and site registration with state and local EMS agencies.

Additionally, once a provider level beyond lay responder is selected, an organization would need to follow state-specific requirements for using prehospital care providers. This may include registering the business as a nontransporting agency and retaining a supervising physician to provide medi-

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Typical wall-mounted first-aid kits are ideal for a minor injury where employees can get themselves to the kit to collect antibiotic and bandage, for example. These kits contain antibiotic, bandages of various sizes, gauze pads, gloves, chemical ice packs, adhesive tape and triangular bandages. These kits are for the general employee population and do not require special training. A separate body fluid clean-up kit is affixed to the wall as well (at right).

cal direction to those providers. It would also include supplying the equipment necessary to provide care at the designated level. The required minimum varies by state, but at the lowest level of licensed prehospital care provider (emergency medical responder) equipment may include blood pressure cuff, stethoscope, orophyarangeal airways, oxygen, blood oxygen sensor/monitor, cervical collars and suction units. The steps to complete and maintain these levels of prehospital care are outside this article's scope.

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Medical response team (MRT) medical kits located in an emergency response cabinet. These kits are reserved for members of the medical response team who are certified as first responders or above.

Liability & Immunity

Prehosptial care providers respond at levels above what a lay responder would provide. This may subject them and the sponsoring organization to higher levels of legal liability, and the authors recommend seeking legal counsel on managing these risks. Although a comprehensive description of employer legal requirements, legal liabilities and the applicability of liability insurance coverage is outside this article's scope, the basic issue of legal protection, such as Good Samaritan laws for responders, is a common question from employers and employees.

Good Samaritan laws were enacted to provide lay responders with legal protection to encourage them to provide assistance without fear of liability. Such protections vary widely across states. In some states, they protect both lay responders and prehospital care providers, while in other states they protect only government responders or volunteers. Some states also have enacted immunity protections to encourage people to volunteer in EMS agencies.

These laws raise the standard that must be proved to determine negligence on the responder's part. A harmed person must prove that the responder was grossly negligent or intended to do harm. Because responders must make rapid decisions in dynamic situations and because it is easy to second-guess such decisions after the fact, more states are passing immunity statutes (Nagorka & Becker, 2005).

While Good Samaritan protections and responsibilities for lay responders and prehospital care providers vary by state, typical elements include obtaining consent for care from conscious adults (consent is implied if adult is unconscious); acting in good faith; not abandoning victim once care is started; and never providing care that is deliberately negligent or reckless. Lay responders and prehospital care providers can do much to avoid charges of negligence or recklessness by always remaining within the scope of their training, both in terms of how they respond and, consistent with this article, what employer-provided emergency medical hardware they use.

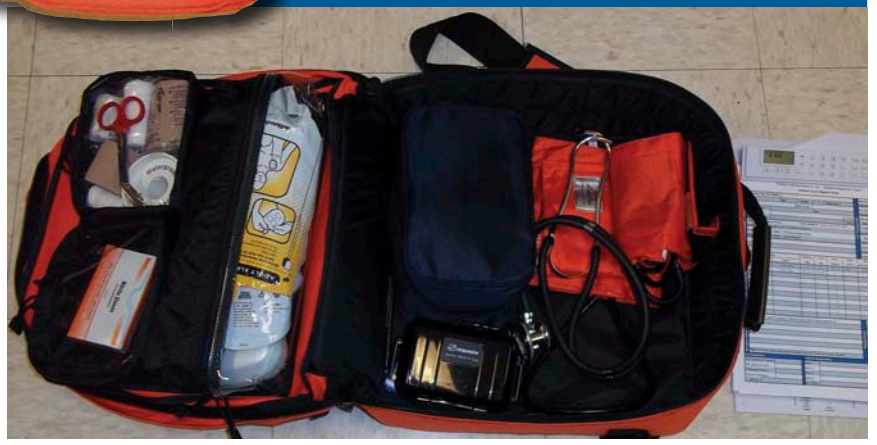
Bloodborne Pathogen Protection

Responder safety is one of the first subjects covered in standard first-aid and prehospital care provider training. Preventing exposure to victims' blood and body fluids dominates this topic, which is the subject of OSHA 29 CFR 1910.1030 (bloodborne pathogens). The standard requires use of "universal precautions or use of barriers such as gloves and eye protection as if all blood and body fluids are infectious and dangerous to the responder."

The ANSI/ISEA standard calling for two pairs of gloves limits the number of responders, assuming their hands match the size of gloves contained in the first-aid kit. Therefore, the authors recommend storing multiple bags of gloves in each kit, ranging in size from small to extra-large. Serious emergencies may require multiple responders, responding employees may have different hand sizes, and gloves may tear and need replacement during response. Kits that contain added eye and face protection provide greater safety for responders as well. The authors recommend all of these items be highly visible and immediately accessible when responders open kits during a response so they may use what is needed before contacting blood or body fluids.

After the response, personnel may encounter contaminated surfaces, gauze with dried blood, gloves and other materials. Adding disinfectants to kits can facilitate site cleanup, as well as render any waste noninfectious and permissible for trash disposal. OSHA's bloodborne pathogen standard does not specify waste as regulated medical waste unless it is liquid, semiliquid or on contaminated sharps such as needles. Such waste would be limited to extreme accidents such as amputations with human tissue, extreme amounts of blood loss, or any needles such as intravenous fluid access used within the scope of practice of a prehospital care provider. Such extreme incidents will likely involve EMS agencies, which often assist with this level of contamination. Employers with prehospital care providers trained and authorized to use such needles should provide contaminated sharps containers with such hardware.

MRT orange bag contains AED and patient assessment supplies, such as gloves blood pressure cuff, stethoscope, oxygen saturation meter, trauma shears, adult and child spare defibrillation pads, and a clipboard with patient care report forms. Basic first-aid supplies are also carried in this kit in case it is separated from the blue bag (see photos on p. 47).



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Respiratory Emergencies

Oxygen is necessary for life, and examples of workplace hazards representing potential oxygen deficiency include permit-required confined space entry, smoke inhalation during fire brigade response and emergencies during commercial underwater diving operations. With the exception of underwater diving emergencies that require decompression, neither American Heart Association nor American Red Cross recommends use of oxygen during first aid. "There is insufficient evidence to recommend routine use of supplementary oxygen by a first-aid provider for victims complaining of chest discomfort or shortness of breath" (Markenson, et al., 2010, S935).

Prehospital care providers frequently use oxygen as part of medical emergency response for patients with breathing difficulty and suspected heart attack. These providers also administer oxygen as a standard part of CPR.

Oxygen is commercially available and marketed as a CPR aid for lay responders. However, lay responders are not typically authorized to use positive-pressure hardware such as bag-valve devices to ventilate unconscious patients who are not breathing, and American Heart Association does not recommend passive devices such as nonrebreather masks by lay responders performing CPR because such devices would not properly ventilate a victim who is not breathing (Berg, et al., 2010). U.S. Food and Drug Administration (FDA, 1987) permits fixed-flow oxygen delivery devices for lay responders without a prescription, but variable-flow devices are limited to prehospital care providers operating under medical direction (i.e., a physician's verbal or written standing orders).

Bleeding & Shock

Circulation of blood is as necessary for life as oxygen, and trauma such as deep cuts or amputations from manufacturing or construction machinery can rapidly lead to death. Direct pressure is a standard skill for lay responders. Large amounts of gauze and dressings are an obvious and easy addition to workplace first-aid kits, and the authors strongly recommend this action.

Tourniquets are seeing a resurgence in acceptance by EMS personnel, due in large part to recent combat experience by U.S. armed forces personnel in the Middle East (Kalish, Burke, Feldman, et al., 2008; Murphy, Colwell, Pineda, et al., 2006; Perkins, 2007; Salvucci, 2009). A standard part of first-aid training as recently as 20 years ago, tourniquets are no longer emphasized for the lay responder. "Because of the potential adverse effects of tourniquets and difficulty in their proper application, use of a tourniquet to control bleeding of the extremities is indicated only if direct pressure is not effective or possible" (Markenson, et al., 2010, S937).

Employees active in hunting and shooting sports may own or be aware of first-aid kits with tourniquets advertised to those markets. Such tourniquets are partially consistent with American Heart Association and American Red Cross recommendations. "Specifically designed tourniquets appear to be better than ones that are improvised, but tourniquets should only be used with proper training" (Markenson, et al., S937).

Hemostatic agents accelerate the clotting of blood, and are the subject of mass marketing campaigns, with commercial versions available for athletic injuries, nosebleeds and pets. "Their routine use in first aid cannot be recommended at this time because of significant variation in effectiveness by different agents and their potential for adverse effects" (Markenson, et al., 2010, S937).

If these agents are added to workplace first-aid kits, their expiration dates must be monitored as part of a routine inspection program. If hemostatic agents are integrated into dressings and bandages, then lay responders can use them as part of applying direct pressure consistent with standard first-aid training. Older versions packaged in powders or sponges for pouring or packing into wounds may lead to secondary injuries due to the heat generated during rapid clotting. Additionally, pouring or packing anything into a wound may be considered medical treatment permissible only by prehospital care providers and above, not for lay responders. Outside military operations, hemostatic agents are not widely used by EMS personnel (Perkins, 2007; Salamone & Pons, 2007).

Musculoskeletal & Spinal Trauma

Contact with high-force energies found in machinery and rapid deceleration from falls may result in fractured bones. Splints for arms and legs are readily available, but rarely necessary in urban or other areas with EMS (e.g., 9-1-1) in close proximity, where responding EMS personnel will splint and transport patients. In such cases, the authors

have witnessed employees self-splinting by holding arms close to body, or self-immobilizing by remaining in place until EMS personnel arrive. Rural and other remote areas such as logging, construction or utility sites are a major exception to urban practice, and splinting may be necessary for a safe and comfortable wait or lengthy transportation.

Spinal trauma, including suspected injuries to head, neck or back, represents the most significant potential for serious musculoskeletal injury, including paralysis and death. Spinal immobilization hardware, such as cervical collars and backboards, can be purchased without prescription, but are not recommended for use by untrained lay responders.

> First-aid providers should not use immobilization devices because their benefit in first aid has not been proven and they may be harmful. . . . Immobilization devices may be needed in special circumstances when immediate extrication (e.g., rescue of drowning victim) is required, but first-aid providers should not use these devices unless they have been properly trained in their use. (Markenson, et al., 2010, S938)

Another example where spinal immobilization devices may be appropriate is a logging operation removed from EMS resources. However, if the victim can be safely kept still and in place, then site personnel should wait for arrival of EMS personnel. Even when used by EMS personnel, spinal immobilization equipment presents risk to patients, as recent studies have revealed a high error rate (Erich, 2010; Heightman, 2010).

HazMat Exposure

Chemicals are used throughout industry, construction and other workplaces. The primary response for employee exposure to hazardous materials is removal from skin and eyes with an emergency rinse (Salamone & Pons, 2007) and OSHA's standard includes requirements for emergency rinse hardware. Expansion of kits for HazMat exposure is limited because significant exposure will require resources found only in an ambulance or hospital.

Two exceptions with industrial applicability include treatment for cyanide and hydrofluoric acid. Cyanide is a common chemical in the plating and semiconductor industries. An organization may obtain a prescription for a cyanide antidote kit (Currance, Clements & Bronstein, 2007; Vaughan, 2004). The kit's expiration date must be monitored as part of a routine inspection program. Intravenous injection of the antidote limits its use to paramedics. An EMS agency may require advanced notice that an organization has a kit on site; if the agency's medical director has not approved its use in advance, then the fire and/or ambulance service paramedics may refuse to use it.

Hydrofluoric acid is used in the glassware and semiconductor industries for etching surfaces. Organizations may purchase calcium gluconate gels without a prescription, and calcium gluconate eye drops with a prescription; both have expiration dates to be monitored. Application of calcium gluconate gel on exposed skin is not a substitute for rinsing and evaluation by a physician trained in treatment of hydrofluoric acid exposure, but it may be applied before EMS arrives to rapidly bind the harmful fluoride ion (Salamone & Pons, 2007). Most EMS agencies do not carry calcium gluconate gels, and EMS personnel may agree to use employer-provided gels during patient transportation.

Injection of calcium gluconate solutions into exposed tissue, or arterial injection for systemic exposure of hydrofluoric acid may be performed only by a physician or paramedic trained and authorized to perform this procedure. These solutions are generally not candidates for workplace first-aid kits for use by employees or in coordination with EMS (Currance, et al., 2007; Vaughan, 2004).

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MRT blue bag contains medical treatment supplies including oxygen (and oxygen delivery supplies, such as nonrebreather masks and pocket masks with oxygen inlets), cervical collars, orophyarangeal airways and nasopharangeal airways, bandaging and splinting supplies, mass casualty trauma tags and a body fluid cleanup kit.

Workplace First-Aid Kit Management

Providing workplace first-aid kits adequate for anticipated medical emergencies involves more than purchasing standard kits and supplementing them with additional hardware that matches employee training levels. Other concerns include acquisition, placement, inspection and replacement hardware. It is easy to purchase kits that exceed the ANSI/ISEA standard, but employers must inspect and verify appropriateness. The authors have seen commercially available portable trauma kits with oropharyngeal airways, which lay responders are not trained or authorized to insert into throats of unconscious victims. In terms of kit placement, rapid access is better than delayed access, and this may require installing more than one kit in large or complex facilities. The authors also caution that victims may not be conscious or mobile, and portable kits may allow faster response than fixed, wall-mounted kits.

Although not specified in OSHA's standard, regular and documented inspections by a designated, trained and qualified employee or contractor ensure that hardware is in ready-to-respond condition. AED pads, antibiotic ointments and hemostatic agents all have expiration dates; AED batteries die; and some storage conditions may reduce hardware shelf life. The authors are aware of one tragic incident with a rarely used bag-valve mask in an ambulance-side compartment that passed visual inspection on a daily checklist, yet over time and due to exposure to the heat of the Texas sun, the plastic wore down and the mask cracked and failed during a response involving a drowned infant in a bathtub. Finally, replacement supplies ensure hardware availability immediately after an emergency response instead of waiting weeks for a delivery.

Conclusion

SH&E professionals have a duty to address emergency preparedness even as they focus on

their goals of incident and injury prevention. Occupational and nonoccupational medical emergency response remains a critical part of a workplace emergency response program.

The minimum contents of a workplace first-aid kit, as defined by ANSI/ISEA and referenced by OSHA, are not up to the task of serious emergencies, and employers are prompted by these standards to upgrade with attention to the hazards in their operations. However, employers must use caution when upgrading their kits and ensure that no supply exceeds the skill set or legal limits of their employees' level of certification. For this reason, aligning hardware to hazards requires attention to employee training so any response does no harm to the patient, the responder or the organization. **PS**

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