

The final first aid kit suitable for use on any live-aboard dive boat is recommended as follows:

First aid item	Boat category
⇒ Symptom/ incident recording chart	(E)
⇒ Pencil	(E)
⇒ First aid guide e.g. DAN pocket guide	(E)
⇒ Pen torch	(E)
⇒ Flashlight	(E)
⇒ Laerdal Pocket Mask™	(E)
⇒ Oxygen tank, sufficient for return journey to shore	(E)
⇒ Oxygen masks, child, adult size with compatible tubing attached	(E)
⇒ Demand Valve O2 delivery system	(E)
⇒ Bag-valve-mask – with oxygen adaptor (for non-breathing victim)	(E)
⇒ Vinegar (jellyfish stings)	(E)
⇒ Hot packs	(E)
⇒ Alcohol based hand cleansing gel	(E)
⇒ Disposable nitrile gloves: 2 pairs	(E)
⇒ Sterets: Pre-injection alcohol swabs	(B)
⇒ Povidone iodine swabs x 4	(E)
⇒ Sterile irrigation solution	(E)
⇒ Gauze swabs x 5	(E)
⇒ Gauze dressing pads – small x2	(E)
⇒ Gauze dressing pads – medium x2	(E)
⇒ Gauze dressing pads – large x2	(E)
⇒ Pressure dressing pads x2	(E)
⇒ Non- adherent dressings, various	(E)
⇒ Adhesive dressings – assorted	(E)
⇒ Eye pad	(E)
⇒ Triangular bandage	(E)
⇒ Elastic bandage	(E)
⇒ Conforming bandage	(E)
⇒ Elastoplast tape	(E)
⇒ Non allergic adhesive tape, e.g. micropore	(E)
⇒ Safety pins	(E)
⇒ Splinter removal forceps	(E)
⇒ Sterile gloves, assorted sizes	(E)
⇒ Suture material, assorted sizes	(B)
⇒ Sterile suture forceps	(B)
⇒ Sterile needle holder	(B)
⇒ Sterile scissors (<i>researcher addition. This did not reach consensus although suture materials were chosen</i>)	
⇒ Disposable scalpel	(B)
⇒ Disposable needles	(B)
⇒ Disposable syringes 2ml, 5ml, 10ml	(B)

- ⇒ IV cannulation equipment (*researcher addition. This did not Reach consensus although giving set and fluids were chosen*)
- ⇒ IV fluid giving set (B)
- ⇒ Intravenous fluids: 2 x 500ml Normal saline (NaCl 0.9%) (B)
- ⇒ Paracetamol (acetaminophen) 500mg tablets (B)
- ⇒ Voltaren (diclofenac sodium) 25mg (B)
- ⇒ Stronger injectable analgesia, e.g. pethidine 100mg (B)
- ⇒ Hydrocortisone cream 1% (B)
- ⇒ Antidiarrhoeal capsules, loperamide 2mg capsules (B)
- ⇒ Antacid e.g. gaviscon (B)
- ⇒ Oral steroids, prednisolone 5mg (B)
- ⇒ Oral antibiotic e.g. amoxicillin 250mg tablets – broad spectrum, for chest, ear, tooth, bowel, urine infections (B)
- ⇒ Alternative oral antibiotic e.g. erythromycin 250mg tablets – use if allergic to penicillin. For chest, ear, eye, skin and bowel infections (B)
- ⇒ Broad spectrum antibiotic for intramuscular use (B)
- ⇒ Local injectable anaesthetic, 0.5% lignocaine (B)
- ⇒ Adrenaline 1 in 1000 ampoule x 5 (B)
- ⇒ Chlorpheniramine ampoule 10mg (B)
- ⇒ Foley catheter, 14F, 16F (B)
- ⇒ KY jelly sachet (B)

Figure 14

Reminder of boat categories:

B = REQUIRED for any dive boat carrying clients with a wide range of age, fitness and dive experience, travelling far (> 2 hrs) from shore with potential exposure to hazardous marine life, adverse surface conditions and unpredictable currents.

E = REQUIRED for *all* dive boats, regardless of trip duration and client demographics.

Interestingly, the only two boat categories in which consensus were sought were ‘B’ and ‘E’. If one considers these two categories one can see that a single first aid kit would suffice for both options i.e. in all live-aboard dive boat scenarios.

Consensus was reached on the following points:

- ✓ If the dive boat is going far from shore into potentially hazardous sea conditions, carrying clients with a wide range of age, fitness and dive experience, the minimum (current) first aid qualification amongst the crew should be PADI rescue diver or equivalent, covering AED use, rescue techniques, first aid and pressure related incidents.³⁹

The general leaning of the group was towards a PADI rescue diver or equivalent qualification for crew members on *any* recreational dive boat although consensus per se was not achieved.

- ✓ The boat should not leave shore unless the medic-alert box (first aid kit) has been checked by a crew member with appropriate first aid qualification.

No consensus was reached with respect to whether a dive trip should be postponed if the seal was found to be broken on the medic-alert box.

The general leaning of the group was that the AED and medic-alert box should be checked, regardless of use, for power, content and expiry dates, by appropriately trained crew once a week and signed for accordingly.

It should be noted, in addition, that panellist's free text comments supported checking the AED as per the manufacturer's recommendations.

There were no strong feelings about the provision of one kit for use by all persons or two kits, one for lay person use and one for use by personnel holding a recognised medical qualification.

Concern arose over the definition of 'qualified medical personnel'. How could this be proven, standardised or guaranteed?

In terms of who should fund the medic-alert box (first aid kit); the dive school or the diver? Opinion varied and comments ranged from:

'The dive school would have to'

'The first aid kit is the price of doing business'

'It depends on the dive school. Some might absorb the cost, some might not'

To

'Likely to pass it on'

'Cost would be passed on to the divers and I think this would be fair enough'

When asked 'Do you envisage the injured individual should be billed at the end of the trip for the consumables used or used on their behalf?' Seven panellists deferred to the insurance company in their comments. Thus one can interpret a consensus view that insurance coverage is deemed essential pre-holiday preparation.

Opinion varied as to whether a dive school advertising safety features such as a comprehensive first aid kit and appropriate crew training might attract more custom.

'I think most divers assume this is in place'

'No, most people are attracted by cost'

'Unfortunately healthy people think they are not going to be sick'

Essentially, one can draw from this that the PADI rescue diver qualification ³⁹ (or equivalent) is held in high regard. A dive boat, particularly a dive boat going far from shore into potentially unknown conditions should carry a crew member with this qualification.

The boat should ideally hold a first aid kit which should ideally be checked regularly (probably weekly) by a crew member with an appropriate qualification, whether used or not, and signed for accordingly.

In terms of who should fund this kit the panel were undecided.

Additional items:

The additional items requested by the panel in the comments sections were included in the round 3 questionnaire, the results of which are demonstrated as follows:

Demand valve in place of non-rebreather O2 delivery system:

Yes	No	Don't know
8	2	0

(2 x dive instructors chose 'no' answers)

2 x 1000ml N/S or Ringers lactate instead of D/Saline:

Yes	No	Don't know
4	4	1

(P 3 failed to answer)

Item	A	B	C	D	E
Diclofenac 50mg	4	4	1	0	0
Aspirin 300mg	0	5	2	0	3
Recipe for making rehydration salts	1	7	1	0	1

Item	Yes	No
Dermatome chart?	2	8
Neuro-observation chart?	6	4
Do you know how to use?	9	1
Do you think public know how to use?	3	7

The following of which reached consensus and have therefore been added to the proposed kit:

- ✓ Demand valve
- ✓ Recipe for making rehydration salts

As can be seen, the consensus opinion did *not* support the need for dermatome or neuro-observation charts although there was more interest in the latter. It was widely felt that the diving public would not know how to use these charts and current dive rescue and/ or first aid courses do not cover these.

If we now consider the panellist's comments, we can narrow this choice of items further. Many of the items were considered surplus to requirements in that they could be improvised from items regularly available on board *any* boat.

'Does one really need a kidney dish or sealable plastic bag?'

'Many of these items could be improvised e.g. from tea towels etc so do they need to be compulsory?'

'Keep drugs simple – one strength only'

'If stocking epipen – no need for adrenalin 1:1000'

Further concern was raised re: the presence of medication in any such kit and whether there are likely to be any persons on board qualified and licensed to administer it.

Comments read as follows:

'Items 16-24 (IV administration set and fluids) would be useful on a deep sea trip but only if you had a paramedic on board. Current diving first aid training does not cover these items'

'Having staff on board the boat qualified to administer medication is a bigger issue for me than just having them (the meds) on board'

'Answers (medication) actually depend on the level of training and knowledge the crew has'

'One has to think of who is on the boat. Morphine is a controlled drug; you cannot have it on a dive boat. You cannot have everything, it is not a hospital. If people are so sick that they need IV or IM medication they should be transferred to the nearest hospital'

'Items 34-38, 43-47, 51 = useful items but beyond the scope of current diving first aid. Would require a paramedic or similarly qualified medic, or an upgrade in diver first aid training'

'Having all materials is one thing, but if the crew is not able to use it, it all stops'

Due to time constraints of the study, no consideration has been made of the age limit for the suggested kit i.e. not for use on children less than 12 yrs? It should be noted that the medication suggested would be appropriate for *adults only*. When considering medication for children extreme caution should be exercised as dosage needs to be calculated per kilogram body weight.

Any person utilising a first aid kit medication component should be aware of the hazards of medicating children and a written warning and/ or dosage calculator (for example for paracetamol) should be prominently displayed in the kit.

It is beyond the remit of this study to consider *who* exactly would provide and replace the medications once used or expired. This would need consideration, with pharmacist input, local to each dive school.

One final panellist suggestion that appealed to the researcher was the following:

- A 'sea urchin kit' containing basic analgesia, a hot pack and instruction.
- A 'jelly fish sting kit' containing hydrocortisone cream, vinegar sachets and instruction.

One would need to consider the percentages of injuries attributed to these 2 agents in order to provide a rationale for the kits suggested. Unfortunately there was no time to do so within this project. The potential for client held kits such as these were therefore not explored but could form the basis of further study in the future. Such kits could potentially be dispensed by the travel health practitioner during pre-travel consultations.

Discussion

The number of divers accommodated on a live-aboard dive boat ranges from 6 -30 (internet holiday search) with up to 17 crew births on larger vessels. Many do not specify how many crew. *Most* do not specify skill and rescue level training of crew.

It has been emphasised throughout this study that the holidaymaker themselves need to take some degree of responsibility for their health and safety. One interpretation of this would be to encourage divers to ask, at point of booking, what first aid and safety provision the boat makes and what qualifications the crew hold.

This in itself assumes a certain knowledge level of the purchaser/ diver in understanding what scenarios might present themselves and knowing what questions to ask or indeed what decision to make with the answers. It is unreasonable to assume that the majority of divers have comprehensive medical knowledge.

In addition to which, the issue of finance has also been raised. Dive boats are usually chosen on the basis of 'what fits one's budget' – and this is often the cheapest dive outfit available.

The challenge therefore is to open the eyes of the diving community to the basic first aid requirements that should be regarded as essential. In the absence of worldwide legislation, divers 'voting with their feet' and actively choosing dive outfits with well maintained and well advertised safety standards may encourage less well equipped dive boats to follow their example. The well informed consumer could lead the way.

The aim of the study was to examine the current situation and to offer evidence based guidance as to what any competent dive boat should offer it's patrons in terms of first aid provision. In conjunction with this the study could also serve to better inform the diving public about what to expect from any reputable dive company with respect to first aid provision.

The researcher recommends, in addition to the first aid kit proposal, any individual acting as a first aider in the scuba diving environment should take advantage of rescue diver specialty training. 'Dive first responders' are those who are trained to provide initial care to divers who become ill or injured in the marine or diving setting. The responder should be able to identify the victim of illness or injury, call the appropriate emergency medical services and provide initial care to the patient until relieved by medical professionals with more advanced training.^{19, 36}

Any first aid provision is obviously dependent entirely on the skill level of the boat crew and clients on any one trip. Further to which it is widely recognised that any person offering assistance in an emergency setting should know their limitations and function strictly within their boundaries. When you don't know what to do for your patient, do nothing.^{36, 37} Eastman, Levinson³⁷ add that where there is time to

communicate it is imperative to do so. Telephone advice may be life saving and should not be overlooked as an adjunct to first aid measures offered on site.

Conclusion

If one considers the resulting first aid kit of choice, see figure 14, One can see that the panel chose, in the majority, to narrow the kit down to a relatively small number of essential items with little medication and a low threshold for removing injured persons as soon as possible from the dive boat itself into the care of advanced medical practitioners.

It has been noted that land based appropriate medical provision varies tremendously world wide.

If one then considers the Divers Alert Network 'Guardian Plus First Aid Kit', see *appendix 14*, it can be seen that they are remarkable similar. Our panel chose to add IV fluid resuscitation measures.

It was not the intention of the study, from the outset, to confirm or support the purchase of the DAN kit (which retails at US\$ 125) and indeed it has been demonstrated that there are difficulties purchasing DAN items from certain geographic locations. It is an expensive kit for individuals to purchase and keep topped up as items expire.

When considering medication items, the panel did express concern as to who would administer more complex medications and/ or life saving measures and in a world where litigation is increasingly commonplace this is no real surprise. The age limit of the diving holidaymaker was not considered but note made of the caution required if treating children. The first aid kit was primarily designed with adults in mind.

No conclusion was reached as to who should provide the recommended first aid kit and maintain the content. It was hoped the panel would conclude overwhelmingly that this cost and responsibility should be borne by each dive school.

It was not felt that advertising, by the dive school, of first aid measures and competent crew would increase sales. The price of the trip being cited as the most usual attraction i.e. the cheapest outfit. However it was agreed that crew members should hold rescue diver (or equivalent) current qualifications.

It should be noted that the validity of the results has ultimately been affected by the response rate which dropped to 56% by the final round despite the sustained efforts of the researcher.¹⁴ Implicit in this is the importance of maintaining contact with and involvement of the panel. The researcher attempted to sustain contact at all times with regular email thanks and updates as the study progressed. The panel were asked at each stage if their non -response was an oversight, due to not receiving the documents, due to time constraints or a wish to withdraw etc and in many cases this prompted a satisfactory contribution.

Appendix 14: Divers Alert Network DSS – Guardian Plus First Aid Kit

The E-Z Care™ System will help you confidently and quickly provide first aid by organizing first aid supplies into injury-specific compartments, making it easy to find what you need, when you need. Dimensions are 10-5/8 inches L x 9-11/16 inches W x 6-7/8 inches D.

Kit includes:

- 1 DAN Dive and Travel Medical Guide
- 1 Pair nitrile gloves
- 1 DAN Oronasal Resuscitation Mask

Medications / Tools Module

- 2 Ibuprofen (2/pkg)
- 6 Diphenhydramine (antihistamine)
- 4 Sting relief pads
- 4 Acetaminophen (2/pkg)
- 4 Antibiotic ointments
- 2 Antacids (2/pkg)
- 3 Thermometers - disposable
- 1 Antidiarrheal caplet
- 3 Cortisone cream
- 1 Antimicrobial towelette
- 1 Hot compress
- 1 Disposable razor

Fractures / Sprain Strain Module

- 1 Cold compress
- 2 Triangular bandages
- 1 Ibuprofen (2/pkg)
- 3 Safety pins
- 1 3" Elastic bandage

Stop Bleeding / Shock Module

- 2 4" x 4" Gauze pads (2/pkg)
- 1 8" x 10" Trauma pad
- 3 Antiseptic towelettes
- 1 Pair nitrile gloves
- 1 Pencil
- 1 Accident Report Form

Wounds (Cuts) Care Module

- 1 20cc Irrigation syringe with tip
- 5 Providone iodine swabs
- 15 Strip bandages 1" x 3"

- 5 Knuckle wound strips
- 2 Patch bandage 2" x 3"
- 1 Wound closure strips (.25" x 1.5" - 10/pkg)
- 5 2" x 2" Gauze pads (2/pkg)
- 4 4" x 4" Gauze pads (2/pkg)
- 1 Cotton swabs (2/pkg)
- 3 Non-adhering dressing
- 2 2" Conforming gauze bandages
- 1 Adhesive tape 1" x 10 yds
- 1 EMT shears
- 1 Splinter picker forceps
- 2 Tincture of benzoin swabs
- 3 Antiseptic towelettes
- 2 Stockinette bandage
- 1 Eye pad
- 1 Eye patch
- 1 Eye wash 4 oz

