Introduction of Modern Stretchers in Armed Forces for Improving Casualty Evacuation in Field with Special Reference to Casualty Evacuation in Mountains

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Abstract

Indian Army has two service stretchers, the Stretcher Folding Light Weight and the Ambulance Stretcher Mark II. Few Imported stretchers have limited distribution. Units also improvise stretchers. Troops deployed in the forward areas deserve better stretchers to facilitate casualty evacuation especially in mountains. Modern stretchers suitable for the Indian Armed Forces have been described. If provisioned, they will improve the efficacy of combat survival, and combat medical support in the field, especially in mountains.

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Introduction

Troops are often deployed in inhospitable and far-flung posts; especially in the mountains. The survival of these troops is dictated by the altitude, terrain and the climate peculiar to the specific region which may have either barren hostile glaciers, high peaks with intervening deep gorges, extremely cold climate in high altitude areas, high ambient temperatures of the western region or the cold and moist climate of the eastern region. Factors peculiar to the terrain will merit consideration to determine the kind of stretchers required for casualty evacuation.

Background

Carriage of casualties rearwards is cumbersome especially during operations. Infantry units have Ambulance Stretcher Mark II and Stretcher Folding Lightweight, quantity 12 each; the former for loading and unloading patients from ambulances and the latter as the mainstay of casualty evacuation by stretcher-bearers. These stretchers have existed for over forty years and are universally perceived to be heavy. Addition of variety in inventory of stretchers will improve the quality of casualty evacuation in field.

Aim

To list modern stretchers for introduction in the Army which qualitatively improve casualty evacuation in field, especially in the mountains.

Scope

Cost factor being dependent on method of procurement, quantity and price negotiations, has been kept out of scope of this article which also makes no attempt to comment on the effectiveness of stretchers already procured centrally.

The existing stretchers

The dimensions of existing stretchers in use are as per Table 1.

Table 1
Dimensions of the existing Ordnance stretchers in use

Parameter	Ambulance Stretcher Mk II	Stretcher Folding Light Weight
Length of stretcher	2.325 m	2.250 m
Length of canvas	1.85 m	1.80 m
Height above ground	0.15 m	0.10 m
Weight	13.63 -14.45 Kg	6.8 - 7.18 Kg
Breadth of canvas	0.6 m	0.6 m

The Stretcher-Folding Lightweight has many inadequacies. It is heavy being 7 Kg approximately, and is not conveniently portable. It does not have patient restraining straps. It is uncomfortable for heavy casualty. It has double folds with heavy canvas prone to tears. It only fits in the racks of light ambulance and not in those of 4 X 4 Ambulance 1 ton or its replacement.

Height of Indian troops

In order to recommend the ideal dimensions of modern stretchers for use in future, the height of the recruits was recorded at a zonal recruiting office, recruiting one-fifth of the recruits in India.

As per pilot study the mean height of the recruits was 174.5 cm with a standard deviation of 10.87 on a sample size of 472 [1].

However a much larger sample of 15479 recruits was taken to further improve upon the statistical estimates. Age and caste wise heights of 15479 recruits were recorded. The value of the 95th percentile for soldiers from the plains was 179 cm and that for the soldiers from hill states was 177 cm. The 3 cm heel on Boot DMS or equivalent boot was also added to the recorded height. Thus a canvas of minimum length of 182 cm for units with soldiers from the plains and 180 cm length for soldiers from hills will be capable to accommodate 95% of all casualties. As a length of 2cm will not add to the weight of the stretcher appreciably, a stretcher with universal canvas length of 182 cm is considered statistically appropriate for the Indian soldier.

The handle bar should routinely extend a distance of 24 cm on either side for the body movement of the stretcher-bearer. Thus the overall length of the stretcher must be 230 cm.

Peculiarities of the terrain and environment

The mountains have varied environment. As a sample peculiarities of those in north are considered. In the east higher rainfall will be an added parameter

- (a) In corps zone 'A' and 'B', troops are deployed on rugged mountains with heights ranging from 500m to 5200m with severe winter when heavy snowfall disrupts limited communication network for almost six months dividing formations into isolated air maintained pockets.
- (b) In some parts of corps zone 'C' there is a high altitude cold desert with heights varying from 4200m to 6300m, a rarefied atmosphere and temperatures falling to minus 40 degrees Celsius. Avalanches isolate forward posts for months closing limited roads and tracks available. In the wide valleys snowmobiles/scooters are necessary for logistic support. Unpredictable weather often precludes helicopter casualty air evacuation.

Problems in casualty evacuation

The gradients are steep. Casualties are brought down from the posts to the regimental aid post (RAP) or taken directly to the roadhead due to wide frontage sometimes by 12 stretcher-bearers or more taking a few hours to 1-2 days, to reach the advanced dressing station (ADS)

or the forward surgical center (FSC); especially when the enemy artillery is active or the weather inclement.

Ideal parameters of stretcher for Indian troops, terrain and environment

Ideally a stretcher should be light, rugged, tensile and foldable to assist in storage and carriage. It should be washable, fire retardant, equipped with a harness for hands free carriage, compatible with various modes of casualty evacuation and provided with an attachment to fix an oxygen source at the head end. Further it should also have straps to restrain head for cervical spine injury and body restraining straps. It should be operational at subzero temperatures, compatible for winching operations and have a canopy to protect the patient from the elements.

Stretcher Scan for general use

Section Litter. At the Forward Defended Locality (FDL) a light foldable stretcher carried on person (a "litter") is a mat of a tough fabric with handles not exceeding 1 Kg in weight, foldable and packed in the haversack of each soldier. The basic design of the litter is depicted in Fig 1. Such a stretcher (Rs.100) is made from black 1000 Denier Cordura (combat nylon), reinforced with three ribs of 1" polypropylene belting running the full length along each side and through the center. Three loop-strap handles on each side are structured from 2" wide belting sewn continuously across the full width of the stretcher providing even greater support. Four to six persons can carry a casualty on the litter. Its dimensions are 185 X 60 cm weights 1 Kg but have lifting capacity of 200 Kg.

Stretcher Scan for use in Mountains

- (a) "*Rescue Stretcher*". At high altitudes a casualty could be enclosed while being evacuated in the Rescue Stretcher (Fig 2). Its dimensions are 220 X 85 cm weighs 4 Kg but has lifting capacity of 200 Kg.
- (b) "*Heli-Lift Stretcher and Hypothermia stretcher*". At high altitudes a heli-lift stretcher provides maximum security, and protection while the casualty is being heli-lifted. It has the same design as 'Rescue

Fig. 1 : Basic design - section litter

stretcher' with straps for horizontal lifts by helicopters (Fig 3). To make it operational in very low ambient temperatures, it has an insulating blanket when it is referred to as Hypothermia stretcher depicted in Fig 4. It can be rolled up for stocking or carrying. Its dimensions are 220 X 85 cm weighs 6-8 Kg but has lifting capacity of 300 Kg.

These stretchers are made from a laminated sheet of medium density polyethylene and expanded polymeric foam of cross linked closed cells which gives high tear strength and high bearing load capacity, combined with comfort and thermal insulation. The material is water and chemical resistant. On exposure to fire the stretchers melt. The sheet thickness is 6 mm; tensile strength 600N/50 mm width; thermal conductivity 0.039 W/mK and working temperature range is -40°C to +70°C.

- (c) *Inflatable stretchers*. This stretcher is foldable and can be inflated with compressed air or a pump. It has straps for restraining the patient and his neck. It has slats such that folded it rolls in one direction but inflated it is used in reverse side preventing bending. A casualty with suspected spinal fracture can be safely carried on this stretcher. Being light, it can be carried by long-range patrols easily (Fig 5). Its dimensions are 183 X 92 cm weighs 8.5 Kg but has lifting capacity of 100 Kg. It needs 6-8 stretcher-bearers to carry one casualty.
- (d) *Basket Stretcher*. Made of fiberglass or aluminum it can be effectively used on the snow to pull a casualty like on a sledge (Fig 6). It can be fitted with head and face protection. For casualty with suspected spinal injury, a spine board can also be used (Fig 7). With floats attached it can be used to rescue a casualty from water. It can be winched up horizontally or vertically. Its dimensions are 216 X 61 X 18 cm weighs 12.5 Kg but has lifting capacity

of 268 Kg.

- (e) *Spine Board*. A flat fiberglass board (Fig 7) that is primarily designed to lift patients with suspected spinal injuries by strapping them.
- (f) *Para guard Stretcher*. It is an aluminum and vinyl folding rescue stretcher that fully encloses the patient. It can bend in the middle whilst still holding the patient securely. It has telescopic / foldable carry handles (Fig 8). It is compact and ideal for search and rescue operations being suitable for vertical or horizontal lifting and may be used for helicopter rescue missions. It can be carried using the four integral carrying handles, which clip out of the way when not in use. The casualty is placed on foam filled pads supported by parallel tubes. High visibility flaps and colour coded adjustable straps secure the lower legs, thighs, arms and chest. The head is held in place comfortably by a three-point forehead strap, and a figure of eight strap, supports the feet. It packs into a back mounted valise. Its dimensions are 183 X 33 cm, weighs 13 Kg and has lifting capacity of 150 Kg. It has the following accessories:-
- (i) Four Point Lifting Sling - attaches to it by means

Fig 5. : Inflatable Stretcher

Fig 6. The Basket Stretcher

Fig. 2 : The rescue stretcher

Fig 3. Heli-Lift Stretcher

Fig 4. Hypothermia Stretcher

Fig 7. The Spine Board

of Karabiners, for horizontal lifts.

- (ii) Foldable Carrying Handles – at the head and foot end of the stretcher allowing two attendants to carry the casualty.
 - (iii) Shoulder Harness - attaches to the head and foot ends to help distribute the weight of casualty on the stretcher.
 - (iv) Foul Weather Sheet - for protection of the casualty against the elements.
 - (v) 60m line - to steady the stretcher and prevent it from oscillating due to the down draft of the helicopters' rotors.
- (g) *Neil Robertson stretcher* : It is required for specific mission related scenarios where the casualty may have to be extricated from a narrow hole or may have to be winched up vertically especially in the naval setting (Fig 9). It is a flexible protective case made of semi-rigid canvas with wooden/bamboo slats sewn on the outer length of the stretcher fitted with four rope handles for carriage, on the outer side. The upper portion of the head end takes the head and neck, which can be steadied by a strap across the forehead. A 12-foot length of handling line is spliced on the O-ring at each end to prevent the casualty from swaying against bulkheads while being lifted.
- (h) *Spine Aid stretcher (Fig 10)* - It is strong, lightweight all aluminum structure designed to

Fig 8 : The Paraguard Stretcher

Fig. 9 : The Neil Robertson stretcher

support and restrain patients in a variety of immobilized positions. It has six adjustable restraining belts with adjustable belt positions to maximize immobilization. There are head immobilization pads and Velcro strap for effective Cervical Spinal Immobilization. It can be X-rayed. It can also fit into most basket type stretchers

- (j) *Ferno-Washington Orthoscoop stretcher (Fig 11)*. It is a specific device used for suspected spinal injury [3]. It has two parts with metal blades, which are clipped on after placing on either side of the patient, thus scooping up the patient directly on to the stretcher. All metal construction in subzero temperatures may cause severe metal burns to the casualties. Plastic coating on the blades may help prevent these. Straps are provided for strapping the casualty and also for winching by a helicopter. It is not suitable for casualty carriage by stretcher-bearers over long distances not being ergonomically designed for that purpose. When open it is 201 cm long, otherwise its dimensions are 166 X 43 cm, weighs 8 Kg and has lifting capacity of 156 Kg.
- (k) *Emergency / Folding stretcher*. It is suitable for casualty evacuation by stretcher-bearers. It is light, sturdy and has a single fold e.g. Bell emergency stretcher (Fig 12). These have castors at one end and runners at the other for ease of loading in an ambulance.
- (l) *Bell Mountain / Ski stretcher (Fig 13)* - It can be used for evacuation of an insulated casualty strapped onto the stretcher which can be pulled as a sledge on skis. It comes packed in two-piece pack-frames

Fig 10 : The Spine Aid Stretcher

Fig 11. The Ferno Washington Orthoscoop Stretcher

which too can function as an additional stretcher.

- (m) *Pack frames* (Figs 14, 15) They provide support for carriage of Bell Mountain Stretcher as one piece or as separate halves. Each pack frame is therefore provided with a linking plate and four thumbscrews plus a support in order to assemble the halves. The pack frames can also be assembled for use as a second stretcher in an emergency.
- (n) *UT 2000*. It is very versatile (Fig 16). It is designed in two parts, each part to be carried by one individual. When combined it forms a formidable stretcher. It can be used as a sledge and can be winched by a

Fig 12. Bell Emergency Stretcher

Fig 13. Bell mountain/Ski stretcher

Fig 14 : Pack frame deployed

Fig 15 : Pack frame separated

helicopter. With floats it can be used to retrieve a drowning casualty. Two stretcher-bearers can carry a casualty over short distances. However it is not suitable for long distances. It has the following features:-

- (i) Length 940 mm (each part) coupled 1800mm, (ii) Width 440 mm, (iii) Height 120 mm, (iv) Weight coupled 7 Kg, (v) Load capacity 140 Kg
- (o) *Medevac 4 Stretcher*: (Fig 17) This is a light weight stretcher that folds twice, is 52 cm long when folded and thus can be carried conveniently as a backpack with no protrusions over the shoulder. It weighs 4.8 Kg. It comes with a transfusion bag hanger as well. The technical details are as per Table 2.

Table 2

Technical details Medevac4 Stretcher

	Folded	Extended
Length	52 cm	207 cm
Width	17 cm	55 cm
Height	14 cm	15 cm
Weight	4.8 Kg	4.8 Kg

Stretcher Scan for use in Helicopters

Indigenous Stretchers. For facilitating air evacuation, an indigenous helicopter stretcher MKII SS has been designed by the Indian Air Force. It is suitable for transport of cases of spinal injury, limb fractures and abdominal and thoracic injuries giving good support to the spine. It has two straps to stabilise the patient. It has telescopic handle extendable by 6.5 cm. It has a

Fig. 16 : UT 2000 Stretcher

Fig 17. Medivac 4 stretcher

Fig 18. Indigenous Helicopter Stretcher Mk II

weight bearing capacity of 94 Kg. With a patient, it can be lifted by two or four persons. It is sturdy and practically has no wear and tear. It is easy to clean, if soiled. It is compatible with Chetak helicopter and ground ambulance. Two such stretchers can be fitted in Chetak helicopter. It costs about Rs 600 and therefore is cost effective and commercially viable. Its dimensions are 175 X 51 cm, weighs 14.5 Kg and has lifting capacity of 100 Kg.

Recommendations

No universal stretcher will suit all types of scenarios of casualty evacuation. Stretchers specific for the purpose must be introduced in units. Special stretchers must be provided to the units as “sector stores” for the duration of their deployment in that sector.

The scale of provisioning of stretchers may need a review. A foldable “litter” could be provided to each section and to each BFNA. The police and the para-

military forces could also effectively use these stretchers to remove the injured during police firing and street demonstrations humanely instead of half dragging and half picking them up as is often seen on television.

Summary

With the advancement and availability of technology, there should be no need to use the conventional “improvised” stretchers using belts and poles. The soldiers instead should be carrying their modern stretchers (litters) in their haversacks if not in their pockets!

Such modern stretchers could be procured as sector stores for use of “turnover” units for their use while in the specific sector.

Provisioning of modern stretchers for the non-medical units and medical units deployed in forward areas is an inescapable necessity.

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