Methods of dealing with Wounded
in
Naval Warfare

Thesis
by
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Introductory Remarks.

A Medical Officer in the Royal Navy being constantly confronted with the possibility of having to deal at short notice with a large number of surgical cases, in a limited space, and with a limited number of trained assistants, has his mind constantly exercised as to the best methods of dealing with this problem; and after some years service, is perhaps more competent to write on this than on most other Professional Subjects. I trust therefore that the following remarks, the outcome of 18 years personal experience in the Royal Naval Medical Service, may be accepted as my Thesis for the degree of Doctor of Medicine at Edinburgh University.

The modern British Navy, the most powerful in the World, and possibly because it is so preeminently powerful, has not, since it assumed its present form, been engaged in any General Action with other ships, or even in any operation where individual ships have been severely handled by an enemy; so that any plan for aiding wounded men in action, must
so far as British Ships are concerned, be more
or less tentative, and based on the experience of
others, who have borne the brunt of battle under
modern conditions.

On the subject in question, there have been
many and diverse opinions, the causes of which
may be thus briefly summarized:

1. The subject is one of continual evolution
and in late years of very rapid evolution, owing
to the constant improvements in ship construction
on one hand, and in offensive weapons on the other.

2. Lack of actual practical experience in our
modern many, under the actual fire of a
powerful adversary.

3. The fact that different types of ship require
totally different arrangements for disposal of wounded.

4. The fact that any arrangements made must
usually be a compromise between the ideas of
the Medical Officer, who draws up his plans but
lacks the executive authority to carry them out, and
the Captain, who has absolute authority, but
may not approve of the plans in their entirety.

I do not mean to infer that Captains in any
sense underrate the importance of efficient Medical
Arrangements for action, but they have quite rightly
to bear in mind that their ships are primarily Fighting Machines, and not Hospitals, and that their partial conversion into the latter must not be allowed to impair their efficiency as the former.

In the following pages, when formulating my own opinions, I shall endeavour, in instances where they differ from those of others, to give satisfactory reasons for arriving at such conclusions, and here I may mention that I am indebted to the following sources for much valuable information:

5. *Details of the Present Russo-Japanese War which have from time to time appeared in the newspapers.*
7. *Our Navy for 1000 years*, by Capt. S. Bardley Wilmot, R.N.
For convenience in studying in detail a somewhat complex and many-sided question, I have thought it advisable to divide the subject matter into the following sections, which will again be considered in sub-sections.

I. Historical Details.
II. The effects of a Naval Action.
III. General Arrangements for Aiding Wounded.
IV. Working details of a Scheme for a Modern Battleship.

Section I - Historical.

(1) The evolution of the Modern Warship:

(a) In the days of the old Navy, behind whose wooden walls the hardy seamen of a former generation upheld Britain's supremacy at sea, at the beginning of last century, the Battleship consisted of a comparatively short, roomy hull, with thick sides of solid oak, penetrated by tiers of square ports, which corresponded to the various gun-decks.

These gun-decks, which might be as many as four in number, were open from end to end, forming long uninterrupted broadside batteries on
either beam, while amidships were large square ladderways leading from the upper deck right down to the lowest platform in the hold, well below the waterline. The space at the bottom of one of these ladderways was known as the Cockpit.

These, of which the well-known "Victory" was a type, were mostly full-rigged sailing ships, but a few of the latest of this class, and of a more elongated type, were about 1850 fitted with auxiliary Steam Power, and in 1854 saw fighting.

Steam was introduced into the Navy in 1830, when ships of 830 tons were built with paddles. These saw active service at Acre in 1840. In 1841 the "Rattle" was built, and was the first man-of-war fitted with a screw. She was tested in a full-power trial against the "Alert" paddle, and gained an easy victory.

(b) The next epoch in warship construction was marked by the introduction of the ironclad. These vessels were very long, and covered for their whole length above the waterline with ½ inch iron armour, and the number of gun-decks was reduced to two. The "Warrior", which was the first of any importance, showed, as compared
with the largest wooden ships, an increase in length from 240 to 380 feet and in tonnage from 5,900 to 8,900 tons.

The principle of long unbroken broadside batteries with large square ladderways was retained. These ships were essentially screw steam ships, but masts and yards remained and auxiliary sail power was used.

Contemporaneously with these wooden ships of smaller size continued to be built as cruisers and gunboats. They had usually only one gun deck, were unarmoured, and were fitted with sails and auxiliary steam power.

(c). There was next to be observed a tendency to concentrate the offensive armament of the ships into a heavily armoured central battery of fewer but more powerful guns. A fine example of this transition period was the "Hercules", whose chief fighting power lay in a central box battery of 8 - 18 ton guns.

(d). The American Civil War evolved the "Monitor" the whole fighting power of which ship was concentrated in a central armoured turret, the rest of the vessel being practically under water. Our earlier turret ships followed, but the low-
freeboard being found incompatible with seagoing efficiency, this fault was remedied by building up unarmoured ends well above the waterline. Perhaps the finest vessel of this type was the Dreadnought which was completely armoured round the waterline, and also amidships to the height of about 11 feet, the central portion being a citadel with armoured sides and ends supporting two turrets containing heavy guns in pairs. The sides of the citadel were prolonged to the bows and stern in the form of a light unarmoured superstructure, supporting a firedeck and poop nearly level with the top of the citadel.

Full-rigged masts now began to be replaced by military masts with circular fighting tops in which were mounted small guns.

(3) The next thing to be observed was the abolition of the armoured belt at the waterline except at the base of the central citadel, a curved horizontal armoured deck being substituted to protect the vital parts beneath the waterline as was seen in the "Inflexible" and her successors.

(4) With the introduction of the long 13.5-inch guns the turret was gradually superseded by the Barbettes for mounting of the primary armament,
the long guns now revolving quite naked on the top of the stationary barbettes, instead of short guns inside an enclosing turret and revolving with it. Powerful secondary batteries of guns of medium calibre were again introduced in a central broadside position. This type of vessel was seen in the "Admiral" class.

In 1880 Iron armour faced with steel and of a maximum thickness of 18 inches came into use for the strongest positions in Battleships.

Citadels and gunports were now built of light steel plates, a few of the former with some side armour, but most of them with simply an armoured deck about the waterline. The guns were mostly on the upper deck and protected by armoured shields, and want of side armours was compensated by minute subdivision of the hull into Watertight Compartments.

Torpedoes were invented, followed by torpedoes boats and as a natural sequence Torpedo-Boat Destroyers.

(9) In the modern up to date Battleship we see side armours reintroduced all round the waterline and well above it, the armoured lower deck at the waterline is retained, and an additional armoured main deck is introduced.
at a higher level in the citadel, which is also protected by heavy side armor up to the level of the upper deck, which may be also armored.

This increased distribution of armor became practicable about 1888 when thinner plates of specially hardened steel superseded the heavier composite armor plates.

The primary armament of heavy guns is still mounted in barbettes, but the guns instead of being quite exposed have a good portion of their breech ends enclosed in an armored shield or hood which revolves with the guns, the Turret and Barbette principles being thus combined.

Each gun of the secondary armament instead of being in an open battery is now with its crew completely isolated from its neighbors and enclosed in an armored casemate, or else separated by an interposing armored screen.

The heavy military masts with their fighting tops are disappearing and being succeeded by lighter masts for signalling purposes only.

With regard to Cruisers and Gunboats, now at the beginning of 1905, we see all unarmoured vessels rapidly disappearing, the
Diagrams
Illustrating the Evolution of the Modern Battleship.
As Regards Protective Armour
And dates when the vessels were Completed.

Main Armour = Dark Blue - Secondary Armour = Light Blue - Armoured Decks = Black.

1. H.M.S. Dreadnought.
11,000 Tons - Commenced 1895
Armoured Belt - Citadel armoured & upper deck.
Two Turrets.

8. H.M.S. King Edward VII.
16,000 Tons - Commenced 1903
Armoured Belt - Citadel Armoured & upper deck.
Bowel armoured & main deck - 3 Armoured Decks.
Two Barbettes with Hoods - Four Turrets.

7. H.M.S. London.
15,000 Tons - Commenced 1900.
Armoured Belt - Citadel & Bow Armoured & upper deck.
Ends of Citadel & upper deck - local protection 14 guns on main & upper deck.
2 Armoured Decks - Two Barbettes with Hoods.

15,000 Tons - Commenced 1898
Armoured Belt - Citadel and Bow Armoured & main deck.
Ends of Citadel & upper deck - local protection 14 guns on main & upper deck.
2 Armoured Decks - Two Barbettes with Hoods.

14,000 Tons - Commenced 1895
Incomplete Armoured Belt - Citadel Armoured & main deck in centre.
and 2 upper deck at ends - local protection 14 guns on main & upper deck.
One Armoured Deck - Two Barbettes without Hoods.

Adapted from F.T. Jane's Illustrations
larger ones being replaced by heavily armoured vessels of offensive power nearly approaching that of a battleship, and of much greater speed; and the smaller ones by medium-sized vessels of the greatest steaming speed it is possible to attain.

We also see submarine boats supplanting the surface-going torpedoes boats, the latter much increased in size, and the destroyers increased to the size of small gunboats with much improved steaming qualities.

2. The Evolution of Arrangements for Wounded:

(a) General and Official Measures:

By J. S. Preston, R.N., has gleaned from old Naval Surgeon's Journals, among other information, the following facts:

In 1796 there was at Plymouth, a Stationary Hospital Ship called "Le Calm".

In 1797 the Cockpit of H.M.S. Andenent was used by the Surgeon for reception of wounded in Action.

In 1798 there were apparently no regular sick Berths in Ships, but it is mentioned that in the same year there was at Teneriffe a Hospital Ship called the "Dolphin".
In 1801 there were regular war-going Hospital ships, of which the "Alkman" was one in the Baltic. Some of these ships retained their armaments.

In the same year in H.M.S. "London" special preparations were made for reception of wounded, prior to going into action with the Danish Fleet.

In 1804, prizes captured at San Domingo were fitted up as Hospital Ships.

In 1805 at Trafalgar, history relates that Lord Nelson was taken to the cockpit of the "Victory" after receiving his fatal wound, and old pictures represent the famous Admiral being carried down the ladderway by hand.

In 1808 a vessel captured at Copenhagen was used as a Hospital Ship.

In 1812, according to F. Little, serving as a Naval Surgeon in 1825, a paper on the treatment of wounded in battle was published in the Medical and Physical Journal.

In 1827 it was proposed by the Surgeon of H.M.S. "Alligator" that men should be borne in H.M. ships with the rating of nurse. This was negatived.

About 1840, Sick Berth Attendants were first employed on board ship.

In 1844, the Surgeon of H.M.S. "Fremantle"
gave his views on the training of the Sick Berth Staff.

In 1856, First Aid Instructon was given in the "Furious".

In the "Artemisia" and "Sphincter" before Sebastopol, and in the "Tiger" before Odessa, special surgical preparations for battle were made.

The foregoing statistics appear to show that in the time of the old wooden warships, over a century ago and for some 60 years later, the "Cockpit", a position below the waterline, was the recognised dressing station, that preparations were made before battle for the reception of the wounded there, and that Hospital Ships were a recognised institution from early times.

It was not, however, till towards the end of this period that we hear of a specially trained nursing branch being instituted to assist the surgeons, or of First Aid Instruction being systematically given to those outside the profession.

Passing now to modern times, I shall briefly state what has occurred during my own experience in the past 18 years.

I entered the service in 1887, just about the transitional period when the old broadside ironclads
were being supplanted by vessels which were to prove the prototypes of the modern battle ships, and the wooden cruisers and gunboats were giving place to the steel cruisers with protective decks.

One of the regulations then in force was to the effect that the Medical Officers should arrange with the Captain for a suitable place, where he with the Surgeon & Sick-Bed Staff should repair for the purpose of receiving wounded when the ship was exercised at action.

The Non-Combatant Officers, except one accountant officer who attended the Captain, and certain men, usually the Ships' Police, Writers, Stewards, and Bandmaster, were told off to assist the Surgeons. These assistants, the Medical Officers instructed, in such knowledge as he considered would be useful.

It was also laid down that certain of the Ships' Companies, Crewmen of Boats, Markers of Companies, and I think Captains of Guns were to receive instruction in arrest of Haemorrhage and application of Tourniquets, also that 2 men per company were to be told off as stretcher men. Medical Officers at that time supplied all
their own instruments, while drugs, dressings, tonics, stretchers and operating tables were supplied by Government.

Apparatus for dressing wounded, was devised by medical officers, its manufacture on board and the organisation for working it being accomplished by the cooperation of the Captains.

From this period onwards to the present time, a progressively increasing interest in these matters has been taken, both by the Authorities at Head Quarters, and by the executive and medical officers of individual ships, and as regards general measures the following successive improvements may be noted:

The issue of an Ambulance Haversack for Landing Parties, to all ships; this in addition to its original use, has proved most convenient in many sudden emergencies afoul.

The issue to each ship of a set of Ambulance Hammocks, with perimetal and auxiliary straps, for raising and lowering wounded in a vertical position through small hatches.

The issue of a very much extended scale of drugs and surgical requisities, including liberal supplies in a compact form, of almost every useful drug and dressing.

The issue of a Valise for Landing Parties (an improvement on the Haversack), a Field Chest, and an Emergency Dressing chest.

In 1897 during the Benin Expedition, the P. & O. Steamer "Malacca" was converted into a Hospital Ship, and manned by a staff furnished by the Naval Medical Department.

During the late Box War various transports were used
as extemporaneous hospital ships, and the "Maine" was
at the same time fitted out by private enterprise as a
modern floating hospital. This ship has since been
employed in the Mediterranean, manned by a staff
furnished by the Naval Medical Department.

By 1903 all ships were supplied with very
complete sets of modern aseptic surgical instruments
and appliances, at Government expense, and still
more recently sets of Roentgen Ray apparatus,
Microscopes and Bacteriological Cases have been
supplied to the larger ships, and also sets of
appliances for use in First Aid Instruction.

As regards new general orders, beyond memos
directing the drawing up of the abovementioned
stores, I do not, until quite recently remember
many of great importance.

A few years ago the number of men to a
stretcher was very properly increased to four.

In October 1904, however, a very important
series of orders were promulgated, to the
following effect:-

(i) That Compulsory Instruction in First Aid
should be given to certain of the Ship's Company,
representing 30% to 40% of the whole crew, and
including all ranks and classes of officers and men.
(2) That officers and men specially detailed to assist the surgeons should be instructed in nursing.

(3) That first-aid appliances should be placed where they would be readily available for use in action.

(4) Captains of ships were directed to grant the necessary facilities for carrying out these arrangements.

(5) Admirals were directed to report, at annual inspections, the amount and the efficiency of the ambulance work done in each ship.

Shortly afterwards a committee was appointed by the Admiralty to go thoroughly into the whole question of aid to Wounded in War. In this way information was collected and experiments carried out which will probably before long result in putting on a more systematic footing the preparations to be made for casualties in action.

During 1904, the Naval Bandmen were organized into a disciplined body and transferred to the Royal Marines, it being at the same time laid down that they were to be trained in stretcher drill, as the recognised Colour Party of the ships they belonged to, and efficiency in first aid was made a " sine qua non " for advancement in rank.

During this year also an order came out that each battleship was to be supplied with a "Kite's Ambulance Sleigh."

Now at the beginning of 1905 we find that
our new Battleships of the "Edward VII" class are fitted with a lift for sick and wounded, capable of taking a cot with a man in the recumbent position between the upper, main and lower decks.

Having thus given a cursory review of the general official measures which have been adopted, it may be more interesting to note, on the other hand, the results of local orders and individual efforts on the part of Medical and Executive Officers.

(b) Local Work and Personal Experiences:

On a large scale, it has come to my notice, that in addition to the Sick Berth Staff who are trained at Haslar Hospital, other large bodies of men have at different periods been trained in First Aid, notably the Cadets in H.M.S. "Britannia," the Marines in Barracks, and the boys in certain Training Ships.

With regard to work on a smaller scale, done in individual ships, it is manifestly impossible to give a history of each, therefore, at the risk of appearing egotistical, I shall here give a short account of my own experiences, which are probably an average sample of similar work which has been steadily progressing on all sides, throughout the Service.
At the outset I may remark that I have to thank many Executive as well as Medical Officers for numerous valuable practical hints, and that I have invariably found Officers of the Military Branch most willing to assist and cooperate in Ambulance Work, whenever the general work of the ship would permit of it.

In my first ship, the "Hercules", where I was the junior under a Staff Surgeon, I made it my business to keep my eyes open and pick up what was to be learned of the customs of the Service. In that ship the post for the reception of wounded in action was the Sick Bay, which was on the lower deck well forward amidships, with protection from the armoured sides of the vessel. Here, at general quarters, the medical officers, who wore their swords, marched with their assistants; an operation table was set up and all the instruments laid out as for a capital operation at a Hospital, which was apparently the recognised custom at that time. I do not remember there being any recognised stretcher party throughout the vessel, but then it was at that time a Coast Guard ship with a reduced Complement. What occurred to me was this,
that amid the motion, noise, smoke and dust of an action, the operations, so elaborately prepared for, would not be done under the most favourable conditions.

In 1889 I went to the "Dreadnought" in the Mediterranean under a Fleet Surgeon. Here again the post for wounded was the Sick Bay, on the Starboard Side of the Main Deck, within the Citadel, and therefore surrounded by Armour. On this ship, with the sanction of my Fleet Surgeon, who left me a free hand in the matter, and with the cooperation of the Captain and Gunner's Lieutenant, a bearer party was organized out of the First Brigade, who drilled within the Citadel and conveyed imaginary wounded to the Sick Bay. First Aid Classes were also held for the Officers, Petty Officers and the Bearer Party, and all the Members passed for St. John's Ambulance Certificates.

In 1891 I was appointed to the "Defiance" Torpedo School. In this obsolete wooden ship there was of course no preparation for action, but with the sanction of the Staff Surgeon, and the Captain, who took a keen interest in the matter, voluntary First Aid Classes were organized, which, considering that they were held after working hours, were extremely well attended.
My next appointment was in 1892 to the "Cossack," a small cruiser with armoured deck, serving in the East Indies. In this ship, with the cooperation of the Captain and 1st Lieutenant, First Aid Classes were held for the Surgeon's Party, Captains of Guns and Markers of Companies, and the Stretcher Party of 16 Stokers which was told off. In addition, as I had to be present at the rifle range at Aden during the annual practice, I had the opportunity of instructing the greater part of the Ship's Company in Stretcher Drill while they were waiting their turn to fire.

As no protected stations were possible in this ship it occurred to me to subdivide my staff, to obviate the possibility of one shell in action destroying the kit. I had therefore two dressing stations in action, one in the Petty Officer's Mess forward under my steward, and one in the Wardroom aft under my own supervision. There were just about the waterline on the lower deck, above the armoured deck. Wounded were conveyed along the upper deck on stretchers to the square hatches nearest these stations, and covered by canvas chairs which I designed.

I have since modified my views with regard to the wisdom of having any dressing stations in action unless behind armour.

My next ship was the "Eclipse" in the East Indies where I went in 1897, again under a Fleet Surgeon. With the cooperation of the Captain I assisted him in drawing up the following scheme:

The station selected for wounded was the lower deck, just above the Engine Rooms, a position above the armoured deck just above the waterline, where there was a little shelter above the only piece of vertical armour in the ship's rig that protecting the top of the cylinders.

Here the Fleet Surgeon was stationed with the majority of the staff, and to this point all the more seriously wounded were supposed to be lowered by a canvas chair of the pattern I designed for the "Cossack". The adjoining cabins were to be utilized for the further disposal of wounded.

My own station was with the rest of the staff on the upper deck, and our duties were to consist in dressing the minor injuries and rendering assistance where required. The stokers, Fire Brigade worked the stretchers for transporting wounded to the hatch. These men and the assistant to the medical officers received First Aid Instruction, but not the complete St. John's Ambulance Course.
In 1899, I went in the "Astrea" to the Mediterranean and then to China, this time as a Staff Surgeon in charge with a Surgeon under me. She was a medium sized cruiser, with an armoured deck but no side armour.

With the concurrence of the Captain I decided to discard the old idea of rigging up operating tables for use during action, and to place the larger instruments and spare dressings in a safe place until after action.

I stationed the Surgeon with his pocket instruments and a large ready use box of First Aid Appliances forward in the Sick Bay, and took my own station with a similar equipment aft in the Wardroom. The staff of assistants was equally divided between the two stations which were both on the Main Deck and unprotected.

A Canvas littering chair was made for the hatch nearest to each of these stations, wounded were supposed to be dressed at the stations and then passed further down by the same chairs, to the deck below, where in this class of ship there were commodious spaces for their disposal both forward and aft, but quite unprotected.

The idea now occurred to me of distributing
small supplies of First Aid Dressings to the different Fighting Stations throughout the ship. Canvas Haversacks were therefore fitted with Tourniquets, Lint, Wax and Bandages, and sets of 3 wooden splints of useful lengths were attached, and this equipment was hung on a wire hook in rear of each gun.

The Surgeon and myself then went regularly round at General Quarters, and instructed in turn each gun's crew in their use.

The Sikorski Fire Brigade formed the Beaver Party, and there, the Medical Officer's Party, and the Midshipmen also received First Aid Instruction.

Recent events have shown that the plans in these two ships of removing wounded during action to unprotected dressing stations, would be impracticable in actual modern warfare.

My next ship was the “Resolution” Battleship in the Coastguard Fleet in 1902. I found that my predecessor had instituted 3 dressing stations in the bathrooms on the lower deck within the citadel. The position was above the waterline and armoured deck, and unprotected above, but well protected all round by coal and side armour.

Wounded were lowered vertically in the service.
ambulance hammocks down the ammunition tubes, which opened above directly into the casemates of the guns of the secondary armament, and below into the passages alongside the bathrooms.

This scheme I saw no reason to alter, but on the Captain's suggestion, two additional stations were organized for the special use of the barbettes, which were somewhat isolated from the general scheme. The scheme of distributing small depots of first-aid appliances, and training the combatants in their use was also introduced.

On joining H.M.S. "Jupiter", Channel Fleet Battleship in 1903, I found that the 12-inch gun spaces (unoccupied compartments at the ends of the citadel, beneath the armoured deck and waterline) had been used as dressing stations. Being of opinion that the advantages to be obtained in this situation were more than counterbalanced by disadvantages, and proving experimentally that it took 15 minutes to convey a wounded man from the upper battery to one of these spots, with the approval of the Captain this plan was abandoned in favour of the one described in detail at the end of this paper.
This Captain, now Admiral Sir Richard Pococke, took the keenest interest in this matter, and, going a step further than "wounded in action" directed me to plan out a scheme for a temporary War Hospital on board, in case after an action there might not be an early opportunity for removal of wounded from the ship. He was ably seconded by Commander Cecil Prowse, who worked out and had constructed an inclined plane, with sledges to fit, for lowering wounded, which after a few minor alterations answered the purpose admirably.

Captain James Stirling, and Commander R. Nugent, who succeeded the abovementioned officers, also took a great interest in the question, assisted in elaborating details, and granted me every facility for practically testing the working of all the different portions of the scheme described at the end of the paper.

In November 1904, Admiral Lord Charles Beresford, in Command of the Channel Fleet, took a step, which I had not heard of being done before, viz.: the issuing to the ships under his command a local order, laying down certain lines for guidance in making provision for wounded in
action. I was gratified to find, that in its main points this order approximated fairly closely to the plan already organized in the "Jupiter." While writing this paper I have been appointed to H. m. s. "Commonwealth," the second of our newest type of battleships finished this year, and of greater tonnage, offensive power and defensive strength than any previous class, and commanded by my late Captain and Commander from the "Jupiter."

This type of vessel being essentially different from any former vessels in the British Navy, I have added a separate paragraph with regard to her arrangements, in the form of a short appendix, and it will here suffice to say that I have recommended that the general plan for armament, which was adopted in the "Jupiter," should be carried out as far as possible in this vessel, with various modifications and improvements in certain details, to which the construction of the vessel and her contained appliances lend themselves, and which will be described later.
(C) Contemporary Events in Foreign Navies:-

France:-

In 1890, a French Naval Committee decided that ports and passages for wounded should be laid down in the original designs of ships.

In 1895, there was a further recommendation that a senior medical officer should cooperate with the designers in working out details.

The practical outcome of this was not encouraging, as in the "Massina," the space appropriated for wounded was found to be encroached on by electric winches, ammunition hoists etc. It was also nearly inaccessible, the approaches being blocked by men working auxiliary machinery. A high temperature also prevailed in the port selected.

In 1897 a decree enacted that "Auffrezzo Guerriers" were to be supplied - 2 to Battleships and 1 to Cruisers. A Commission recommended in the "Gambos" 11 as the minimum number required. This recommendation was vetoed.

In 1898 a decree enacted that appropriate appliances should be distributed at various ports and that the remaining stocks of instruments etc. should be placed beneath the Armoured Decks.

In 1900 we find Dr. Surdam, writing in
the Archives de Medicine Navale, recommending that uniform regulations should be laid down for management of wounded, and everything not left to the pleasure of the Captain & Surgeon. He also was of opinion that in small ships the Surgeon and medical stores should be kept in shelter during action (magazine or other protected part.)

Italy:

In May 1898, Dr. Rho, an Italian Naval Surgeon writing in the "Rivista Maritima" recommended a multiplicity of well-lighted, well-ventilated, and if possible protected, dressing stations, with 4 bearers attached to each, and temporary accommodation for wounded adjoining them. These should be in direct communication with the fighting parts, but not through the ammunition passages.

During actual action, medical officers were to remain at these posts, dressing any of the less seriously wounded, who might find their way there. Seriously wounded were merely to be moved out of the way of the Combatants.

During a lull, the medical staff were to move out to the fighting parts, arrest haemorrhage, dress
wounds, and remove the wounded to the parts.

All major operations were to be deferred till
the close of action.

Generally speaking, of late years in the Italian
Navy they have been in favour of dressing on the spot
and not attempting transport during action.

Spain:—

From an article in the "Revue Maritime"
Apr. 1900, by Lieutenant Lorc Petit, it would seem
that in the Spanish Ships at Santiago in the late
Spanish-American War, there were posts for wounded
in various positions, wardrobes &c., and also below
the waterline. As will be seen later, neither
position appeared to meet with much success
as a dressing station in action.

Japan:—

At the Battle of the Yalu in 1896,
the Japanese Ships were provided with "Miller's
Choices" (idea borrowed from the Russians), Net-
Hammocks, and Stretchers for transport of wounded,
and they had been systematically drilled; in the
excitement of action, however, when it came to the
point, they discarded these appliances and carried
the wounded, pick a back or by hand seats.

They also copied the idea prevalent in our Navy
at that time, of transporting the wounded during action to one or two unprotected dressing stations containing the medical staff with all their stores and instruments. In action this plan proved a fatal mistake.

In the present war they seem to have adopted the plan of having the combatants dressed in completely clean clothing applying first aid dressings to the wounded, on the spot, and as quickly as possible, which in most instances were left undisturbed until the patient arrived in a shore hospital. This practice has, I understand, been attended with excellent results.

**Russia:**

The following Régime was adopted in the unfortunate "Varyag"—the destruction of which at Chemulpo constituted the first important incident in the present Russo-Japanese War.

First aid classes had been held for instructing of combatants, and Ambulance Bago were distributed before action. The doctors remained below the waterline. Transport of wounded below the waterline was attempted during action, but was found impracticable on any large scale. Stretchers were used in the attempt.
Germany:

In the more modern German ships I understand that there is an armoured operating chamber, with artificial light and artificial ventilation, which communicates with the fighting parts by means of one armoured shaft overhead. I have not seen the arrangements myself, and have no further details.

Section II. The Effects of a Naval Action.

Prior to the evolution of any plans for treatment and disposal of wounded in action, there naturally comes the consideration of what experience has led us to expect in such circumstances.

1. The probable number of wounded in action.

Statistics on this point, in the following table, collected from various sources, show the casualties which have occurred at different periods in ships of different types.
<table>
<thead>
<tr>
<th>Date</th>
<th>Battle or War</th>
<th>Ship</th>
<th>Type of Vessel</th>
<th>Nationality</th>
<th>Killed</th>
<th>Wounded</th>
<th>Complement</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1792</td>
<td>Franco-Brithsh</td>
<td>Soubert</td>
<td>Battleship</td>
<td>British</td>
<td>79</td>
<td>96</td>
<td>700</td>
<td>22%</td>
</tr>
<tr>
<td>1792</td>
<td>War</td>
<td>Mortain</td>
<td>...</td>
<td>...</td>
<td>45*</td>
<td>162</td>
<td>700</td>
<td>21%</td>
</tr>
<tr>
<td>1794</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>45**</td>
<td>115</td>
<td>700</td>
<td>22%</td>
</tr>
<tr>
<td>1794</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>105</td>
<td>160</td>
<td>300</td>
<td>20%</td>
</tr>
<tr>
<td>1801</td>
<td>Copenhagen</td>
<td>...</td>
<td>...</td>
<td>British</td>
<td>86</td>
<td>164</td>
<td>700</td>
<td>31%</td>
</tr>
<tr>
<td>1803</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>French</td>
<td>200</td>
<td>222</td>
<td>600</td>
<td>31%</td>
</tr>
<tr>
<td>1824</td>
<td>Finisterre</td>
<td>...</td>
<td>...</td>
<td>French</td>
<td>55</td>
<td>114</td>
<td>700</td>
<td>24%</td>
</tr>
<tr>
<td>1812</td>
<td>American War</td>
<td>...</td>
<td>Frigate</td>
<td>British</td>
<td>24</td>
<td>79</td>
<td>280</td>
<td>27%</td>
</tr>
<tr>
<td>1837</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>50</td>
<td>120</td>
<td>900</td>
<td>36%</td>
</tr>
<tr>
<td>1814</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>British</td>
<td>24</td>
<td>17</td>
<td>100</td>
<td>22%</td>
</tr>
<tr>
<td>1864</td>
<td>Heligoland</td>
<td>...</td>
<td>...</td>
<td>Austrians</td>
<td>16</td>
<td>100</td>
<td>500</td>
<td>16%</td>
</tr>
<tr>
<td>1865</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>Dutch</td>
<td>14</td>
<td>55</td>
<td>200</td>
<td>7%</td>
</tr>
<tr>
<td>1866</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>British</td>
<td>90</td>
<td>20</td>
<td>100</td>
<td>21%</td>
</tr>
<tr>
<td>1879</td>
<td>Chile &amp; Peru</td>
<td>...</td>
<td>...</td>
<td>Patagonia</td>
<td>97</td>
<td>114</td>
<td>1000</td>
<td>50%</td>
</tr>
<tr>
<td>1895</td>
<td>China-Japan</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>35</td>
<td>60</td>
<td>425</td>
<td>22%</td>
</tr>
<tr>
<td>1895</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>Italy</td>
<td>22</td>
<td>32</td>
<td>800</td>
<td>8%</td>
</tr>
<tr>
<td>1895</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>49</td>
<td>17</td>
<td>220</td>
<td>22%</td>
</tr>
<tr>
<td>1904</td>
<td>Russo-Japanese</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>11</td>
<td>48</td>
<td>400</td>
<td>22%</td>
</tr>
<tr>
<td>1914</td>
<td>Russo-Japanese</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>118</td>
<td>370</td>
<td>1500</td>
<td>52%</td>
</tr>
<tr>
<td>1914</td>
<td>Russo-Japanese</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>115</td>
<td>170</td>
<td>727</td>
<td>25%</td>
</tr>
<tr>
<td>1914</td>
<td>Russo-Japanese</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>210</td>
<td>700</td>
<td>1300</td>
<td>31%</td>
</tr>
</tbody>
</table>

Note: The complement of the older ships marked with a ? are approximate.

The figures for the "Varn" refer to the upper deck complement only, where nearly all the casualties occurred.
From the foregoing figures, which vary less than one would expect for ships of different classes and at different periods, it would seem that provision must be made for casualties which will probably vary from 15% to 75% of the complement, depending on the ship gaining an easy victory or being badly beaten. It will be observed that about 22% is a common figure, both in the early days and in modern times, for ships which were victorious after presumably a fairly tough fight.

In the International Text Book of Surgery, it is laid down that 30% to 50% of the complement may be expected to suffer casualties.

(2) The probable nature of the Injuries to be dealt with.

In 1800 in the "Guillaume Tell", captured off Malta by H.M.S. "Penelope", there were, according to the surgeon of the latter ship nearly 500 killed and wounded. There were 50 capital operations. In several cases where arms and legs were severed all but a small attachment of skin, the patient remained from 8 to 10 hours without haemorrhage of any consequence.

Between this date and modern times we hear of many casualties in action from splinters of
wood, and falling masts and rigging, in addition to the severe direct injuries from round shot. As fires were frequent and extensive in the old wooden ships, many wounded probably suffered severely from burns before succour arrived. From the close quarters at which the old ships fought, the musket was an effective weapon, and we read that in the "Victory" at Trafalgar, many men in addition to the Admiral, fell under the small-arm fire from the "Redoutable". Again, the practice of boarding led to numerous pistol and cutlass wounds.

In a modern naval fight some of these sources of injury still exist, others have disappeared, and the invention of shells filled with very powerful explosives, has introduced a new factor, viz: injury or death to those in the proximity of a bursting shell from mere aerial concussion even in the open air.

Our most valuable sources of information on this subject are the Japanese reports on their late war with China.

The following table shows the causes of wounds in that war, in the order of frequency of occurrence.
### Causes of Wounds in the late China-Japanese War

<table>
<thead>
<tr>
<th>Cause</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fragments of Shells</td>
<td>49.6%</td>
</tr>
<tr>
<td>Ignition of Gunpowder</td>
<td>12.2%</td>
</tr>
<tr>
<td>Indirect Shell Injuries</td>
<td>9.8%</td>
</tr>
<tr>
<td>Combined Burns &amp; Wounds from Bursting Shells</td>
<td>9.0%</td>
</tr>
<tr>
<td>Splinters of Wood</td>
<td>9.0%</td>
</tr>
<tr>
<td>Shock of Shell Explosion</td>
<td>3.0%</td>
</tr>
<tr>
<td>Shock of Gun Firing</td>
<td>2.2%</td>
</tr>
<tr>
<td>Fragments of Doubtful Nature</td>
<td>2.0%</td>
</tr>
<tr>
<td>Unexploded Shell Hits</td>
<td>1.9%</td>
</tr>
<tr>
<td>Scalds (Steam or Water)</td>
<td>0.9%</td>
</tr>
<tr>
<td>Various Minor Injuries</td>
<td>0.9%</td>
</tr>
</tbody>
</table>

Note: Only two cases of Bullet Wound on board ship in the whole war.

In the International Text Book of Surgery, the nature of the greater injuries which occurred on board the Japanese ships at the Battle of the Yalu in the same war, are thus classified:

<table>
<thead>
<tr>
<th>Injury</th>
<th>Cases</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fractures</td>
<td>148</td>
<td>65</td>
</tr>
<tr>
<td>Contusions</td>
<td>79</td>
<td></td>
</tr>
<tr>
<td>Burns</td>
<td>76</td>
<td>2</td>
</tr>
<tr>
<td>Wounds</td>
<td>67</td>
<td>23</td>
</tr>
<tr>
<td>Ruptured Symphysis</td>
<td>19</td>
<td></td>
</tr>
</tbody>
</table>
Dr. S. Suzuki in his admirable medical history of the same war, states that simple Contusions were not of very frequent occurrence, as the velocity of flying fragments was usually sufficient to produce wounds.

Primary Haemorrhage was a rule slight, except in the case of large vessels partially torn across. In all kinds of wounds involving the Femoral Arteries the vessels usually bled.

The amount of shock was variable, and dependent on individual temperament.

Suppuration occurred in most wounds, owing to loss of vitality in the injured tissues, but Syphilis occurred in less than 1% of the wounds, and there were no cases of Septic or Inflammatory Gangrene.

Shell wounds were slow in healing, the average time the cases were under treatment being 2½ months.

Much trouble was caused by fragments of cloth which were driven into the wounds.

In the same war the Surgeon of the "Makushima" reported that his wounded were nearly all more or less burned.

The Surgeon of the "Akagi" reported that cordial lacerations were common, that there was little
primary haemorrhage, but that in some cases after
a few hours secondary haemorrhage had to be
dealt with. He also observed that there was a
quant demand for drinking water during battle,
and remarked that anaesthetics were not much
required during the excitement of battle.

To take a more recent instance, on
board the "Yankee" at Chios in the present
Russo-Japanese war, we hear of ammunition
catching fire on deck and burning men to death,
also of much trouble being caused by fragments
of cloth driven into wounds. There was also
described a peculiar condition of multiform
punctures from ¼ to 1 inch deep, without
scorches, in the presence of foreign bodies, which
was supposed to be due to the extremely porous
nature of the explosive contained in the Japanese
shells, which was found even to pulverize metal.

Still more recently in the Russian forts at
Port Arthur, we hear that men were killed and
injured in the open, by the mere aerial concussion
from shells exploding in their vicinity.

It would thus appear that protein should
principally be made for treating Fractures, Large Lacerated
Wounds, Burns, Haemorrhage (chiefly Secondary) & Concussion.
(3) The effects of Action on the Vessel & its Contents.
This subject is important in deciding where best to arrange for dressing stations, storage of valuable stores during action, and places for operating after action.

In the old actions with wooden ships, masts and rigging came down, the hulls were shattered, and the decks streamed with splinters of wood which frequently caught fire. A common ending was for such a fire to extend to the magazine and the ship to blow up, if she did not previously sink, through water coming in through shot-holes at the waterline.

In modern ships there is less topshamper to fall and the present tendency is to reduce it still further. The wood on board is also reduced to a minimum. The higher velocity of the projectiles shatters the woodwork into smaller fragments, but also breaks and twists the iron and steel work, so that doors, hatches &c. which are meant to close may fail to do so, and others may be jammed so that it is impossible to open them without much labour. Fires occur, but are more easily put out. (They were not successfully combated in the "Yamato" before she was abandoned.)
In the late China-Japanese War, projectiles travelling at a high velocity were found to be deflected in the most extraordinary manner, and to wander all about the ships not only in a horizontal but a vertical direction, spreading destruction in their track.

It has also been clearly demonstrated of late, that the unarmoured portions of vessels in action will be simply riddled by projectiles, and that all individuals and stores within them will be liable to rapid destruction.

The protective value of armour, has, on the other hand, been equally clearly shown.

In 1877 the “Shahi” and “Amethyst” engaged the Peruvian steamclad “Huascaran”. The latter had her crew behind armour, and though the unarmoured upper works were simply riddled, only one man on board was killed.

In 1882 at Alexandria, our Fleet, most of the vessels of which had Iron Side Armour, sustained 76 hits from the Egyptian Batteries. Only 6 men, however, were killed, 27 wounded.

Referring again to the case of the “Virginia”, though there appears to have been a perfect inferno on the unarmoured upper decks, where 73% of
of the combatants suffered casualties, it is reported that beneath the armoured deck all was so quiet, that, except for the fact that in one stakehold the water rose nearly to the furnace doors, they might have believed themselves to be merely at target practice.

The captain, who stood at the entrance to the armoured coming tower was injured, and his bugler was killed, but none of 5 persons within the tower were injured.

It must not be overlooked, however, that absolutely direct hits may pierce armour, and produce havoc behind it, also that casualties may occur beneath an armoured deck, by accidents with machinery, or by bursting of steam-pipes during action, just as they occur in peacetime when working engines at full power.

Submarine attacks by torpedoes or mines may also injure those beneath the armoured deck in addition to flooding the ship; thus in the Japanese Cruiser "Shinyen", sunk by a mine off Port Arthur, 5 men in one engine-room and 3 in the other, were killed by the explosion.

Ships blown up by mines appear to sink very rapidly, but I think in nearly all the
cases of damage done by torpedoes in the present Russo-Japanese war, the vessels concerned had time to gain harbour and be beached in shallow water. In the ‘Brave’, a 12 in. shell striking below the waterline let in 150 tons of water by merely starting the rivets.

Section III. General Arrangements for Aid to Wounded.

Having reviewed the preparations which have at different times been suggested for dealing with wounded in action, and the emergencies which experience has led us to anticipate, there now remains to be discussed the difficult problem as to what arrangements are most likely to give satisfaction in the future.

1. A Special Armoured Berth for Wounded.

This idea has from time to time been suggested, and has I understand been actually carried into effect in the newer German ships, but its practical utility in action has not yet been tested.

The idea of an aseptic operating room, protected by armour, and in a position where medical officers could operate during action, undisturbed
by the turmoil of battle, and whether wounded could be conveyed through an armoured passage, is at first sight an attractive one, but nevertheless there appear to be arguments against it.

The International Text Book of Surgery lays down the following reasons for not having an Operating Room on board ship.

(a) When not in use, under the influences of darkness and damp, the growth of bacteria would be encouraged.

(b) Artificial light is not good for operations. (and I may add that in a battleship its quality is variable, and in action its very existence precarious)

(c) Dangers of septic infection are great on board ships.

(d) The number of trained assistants is limited.

I submit now my own additional ideas on the subject viz:-

(e) Given an Armoured Berth and the Surgeon in it with their instruments and stores, would it be possible to transport the patients into it during action? As will be seen later, all recent experience thoroughly discourages the transport of wounded during action. Therefore if the Armoured Berth is not used during action, the practical
utility of an armoured berth disappears, except as a safe place to keep the surgeons and their stores until after action, and this I think can be arranged without the construction of a special armoured berth.

(g) For obvious reasons, the armoured berth would have to be of limited size, and the armoured approaches narrow and limited in number. It is therefore difficult to see how, with a large number of wounded, congestion to the extent of interference with all useful work could be avoided, even were transport of wounded into the berth possible.

(g) Eyewitnesses of recent actions of Port Arthur state that one of the effects of a 12 inch shell striking a first class battleship was to cause the whole vessel to rock and vibrate, while it was almost obscured by dense clouds of dust, iron, mist and smoke. This would be dragged into the armoured berth by the artificial ventilation and would, combined with the vibration, I think interfere materially with the operations.

(2) *The General Question of Operating during Action.*

(a) Most of the arguments against
operating during action in an armoured berth, will militate even more strongly against the idea of operating during action in ships not so fitted.

(b) In most ships, positions which might be improvised into operating rooms under ordinary conditions would be quite untenable during action.

The Surgeon of the Japanese Cruiser "Akagi" at the battle of the Yalu, who was stationed in the Captain's Cabin, stated that wounded could not be properly examined, much less operating done, till the firing abated. From all accounts operations would have been equally impossible during this action, at the Surgeon's Post, in the other Japanese ships.

(c) In 1910, M. Fontan, médecin en Chef de la Marine de France, in a paper read before the International Medical Congress, stated that it had been practically decided in the French Navy, not to attempt anything beyond First Aid Treatment during an Action.

(d) During the present Russo-Japanese War, I understand that nothing beyond First Aid has been attempted during action by the Japanese.
(3) The Question of Transport of Wounded.

(a) During actual fighting, the question of the desirability of attempting to transport wounded from the fighting parts to more sheltered positions, must, I think, in the light of recent experiences, be answered in the negative.

I cannot here do better than quote the following remarks on this subject by the late Fleet Surgeon E. Hinch, R.N., in the "Journal of the Association of Military Surgeons", Nov. 1901:

"In all modern Navies, it has been the custom in time of peace, and until recently, the intention in time of war, to remove wounded at once from where they fell, to the surgical station for immediate treatment. It has for some time been inferred that in future Naval Warfare, it will not be practicable to remove wounded during action, but that they will have to shift for themselves until it is over, or a lull occurs in the fighting; and the experience of the Japanese in their Naval Battles in the late war with China, must be taken as demonstrating that this inference is correct, and that the practice of the past must be abandoned."
In Dr. Beadnell’s translation of Z. Leo’s paper, already quoted, it is stated that in the Italian navy they consider that there can be no transport during actual action.

In the case of the “Yarrag” at Cemalpea, transport during action was nevertheless attempted, with the result that out of 99 cases of casualties, only 6 men were brought down to the doctors below the waterline, and of these five, 3 were already practically dead when they arrived.

(b) During a lull in an action, transport should usually be practicable, and should always be attempted whenever possible in the case of armoured vessels, where the wounded can be grouped in suitable protected quarters.

With regard to such transport, it is estimated in the International Text Book of Surgery that 5 to 10 minutes will be consumed in each transfer, and that when casualties go beyond 5%, the transfer in such cases will be impossible. Personally I think that in certain circumstances, with suitable appliances and men trained to work them, this work could be done more expeditiously. In H.M.S. “Tupiti” in 1904, by means of an inclined plane and
+ slighs, 16 men were experimentally lowered from the upper deck battery, and placed in the bathroom flat, 2 decks below, in 15 minutes.

In H.M.S. "Commonwealth" in the present year, by means of 4 ordinary service cots and the ambulance lift fitted in the ship, 10 men were lowered from the upper deck to a similar position on the lower deck in 15 minutes.

In the case of actual wounded, these operations would, of course, have had to be more deliberate, but on the other hand, with more slighs or cots the process would have been expedited.

In the case of unarmoured vessels, transport of wounded should not, I think, be attempted during a hull in an action.

The International Text Book of Surgery lays it down that grouping of wounded is not to be recommended, unless behind armour. From details given further on, the reason for this will be obvious.

(C.) After Action, in unarmoured vessels, all, and in armoured vessels probably a large proportion of the wounded will have to be transported from where they fall, to a
suitable Dressing Station, and thence to a temporary hospital on board, prior to their final removal to a Hospital Ship or a shore hospital.

4. Methods and Appliances for Transport.

(a.) **Manual Methods:** Again, it is quoted in the International Text Book of Surgery, that there seems to be a consensus of opinion that each ship must devise its own peculiar ambulance drill, appropriate appliances, and system of transport, and that the majority favour hand-carriage methods.

These include of course the 3 forms of hand-seats, 'carrying pick-a-back,' and the 'fireman's lift.' The first is more rapid for short distances than most forms of apparatus, and would be useful in a large number of minor cases, but inapplicable to the more serious injuries. The two latter methods should only be allowable where extreme haste is necessary, such as the removal of wounded from a burning or flooded compartment.

It is noteworthy that in the late China-Japanese war, although various transport appliances had
been provided by the Japanese, and the men drilled in their use, in the excitement of actual warfare they were found cumbersome and troublesome, and were discarded, manual methods being preferred.

(b) Hammocks:—One of the oldest appliances was "Macdonald's Hammock". This was a hammock slung horizontally beneath a spar. It required a wider hatch than is now often found, and may be considered practically obsolete.

Shiva Hammock, an American improvement on the last, has a sliding bar from which the hammock is suspended, enabling it to be hung at an angle.

Under the regime of Inspector General Dick, R.N., when Director General of the Naval Medical Department a hammock was introduced, fitted with auxiliary and perineal bands, into which a patient can be securely laced. By means of this, a man can be raised or lowered vertically through the smallest manholes, ammunition tubes, ash hatches, stockholes, ladderways, etc. It is a valuable appliance for use in such situations, and is more comfortable than it looks.

The "Ennemoor Jacket" is practically an enlarged edition of a "T" Bandage. When applied, the body,
camps, and perimeter are simultaneously supported. Suitable straps are attached, by which the patient can be suspended inside a mattress or hammock.

(a) Chairs:—These appliances for lowering patients though hatches are usually improvised according to the ideas of individual medical officers, and hence their designs are legion. A classical example is that of a case whereby half-way through the equator and half the upper portion removed, and a board nailed across to form a seat in the centre. The idea in all is to combine efficiency with simplicity of construction, rapidity in working, and ease in stowing.

My own design, which is probably not original, is an oblong wooden frame suspended at an angle by slings from a steel cross-bar, to which the lowering tackle is attached, while between the upper and lower ends of the frame is suspended a loose strip of canvas. The patient lies well back in the canvas, with the popliteal spaces resting on the lower bar, and the feet, which should be tied together, hanging down free. It is comfortable, quickly worked, and the patient unless uncontrollably violent has no tendency to
fall out. Where space permits, as in Cruizers with small square hatches, I think chairs are preferable to hammocks, but not to the appliances about to be described.

(e.) Gouttières:— These inventions consist of a rigid frame, moulded to the shape of the patient, with slings for lowering, poles for carrying, and wheels at the heel to allow of wheelbarrow movement. Two good examples are the Gouttière de Bonnet, and Auffret’s Gouttière Métallique.

(f.) Inclined Planes and Sleighs:— Where space permits, as in the majority of our present battle-ships with large square hatches and considerable beam, this is undoubtedly an excellent method of transporting wounded from the fighting decks to the armoured dressing-stations below, and the ideal sleigh is undoubtedly “Kirken’s Sleigh.” This is practically a Gouttière fitted on a light sleigh frame with runners. It has also slings, handles and wheels, so that it combines sleigh, lowering apparatus, stretcher and wheelbarrow. As it has a perimetal support and straps for securing the body and limbs, it can be lowered vertically through a comparatively small opening,
and is infinitely superior to either hammocks or chairs. In the International Test Book of Surgery, the advantages of this contrivance are thus described: "The patient can be securely imbedded, no matter how injured. He can then be slid along passages, and up and down ladders, and lifted over obstacles, with absolute security, and without ever being absolutely suspended in mid air, which is very important if a ship is pitching or rolling.

A small ship supplied with 2, and a battleship with a minimum of 8, and steel inclined planes to fit would be well equipped for transport of wounded in war.

My own experience in H.M.S. "Jupiter" of a wooden inclined plane and sleighs, built in the ship, was most satisfactory, so far as could be judged from experiments in peace time. The apparatus was planned by Commander Prinsep, R.N.

The plane extended from the upper battery, starboard side, through the main deck battery and terminated in a horizontal platform on the port side of the lower deck outside the bathrooms. The plane had a flange on each side to retain the sleighs in descent, but the platform was flush so that they
Diagrammatic Section
Illustrating the Inclined Plane Method of Transporting Wounded in a Battleship

The Inclined Plane is shown in Red.

A. Boat Deck etc.    B. Upper Deck
C. Main Deck         D. Lower Armoured Deck.

R. Hardie.
could be easily slid up to either side. The sleighs consisted of plain boards fitted with wooden runners, and rope handles at the sides for lifting. An ambulance hammock with perineal and auxiliary bands was firmly nailed to the sleigh, and into this the patient was strapped.

(f) Stretchers:— Ordinary stretchers as supplied to our ships, are somewhat cumbersome for rapid transport of wounded, as compared with other methods, but they are of course required for landing parties, and would also be useful in certain situations after a naval battle.

Schn's Cot is practically a stretcher with perineal bands, side head supports and body and leg straps.

(g) Cots:— The British Naval Service Cot, as supplied in some numbers to our warships, is inapplicable to the rapid transport of wounded to a dressing station unless in our newest ships fitted with lifts, but would be invaluable in all ships for disposal of wounded in a temporary hospital after they have been dressed, and also for final removal of wounded to hospital etc.

It consists of a rectangular wooden frame, which fits into the bottom of a canvas box, with
Canvas flaps to lace over the patient. It is fitted with an eye at each end, for purpose of suspension if required.

The Walton - Wells Cot (American), consists of a stout canvas frame with sides, transverse kicking laths being stitched in across the bottom. There are canvas handles at the sides, and poles can be passed through them for lifting. It has no lateral projections, and is narrow enough to pass down any ladder.

(c) Lifts : - In our newest first class Battleships a lift is fitted in the port side of the Citadel, which can transport patients in a horizontal position from the upper and main decks to the bag-rack flat in the vicinity of the bathrooms.

It can carry a service cot or stretcher, or even two patients side by side, and will be invaluable for transporting serious cases.

It is worked by a hand-winch, and as it has to be raised and lowered for the transport of each patient it will not be quite so expeditious for the transport of the less serious cases as the inclined plane system, where a number of sleighs can be rapidly slid down in succession.
(5) **First Aid Instruction:**

Since transport of wounded during action has been found practically impossible, and the small number of medical men on board a warship could not possibly attend within reasonable time, to more than a mere fraction of those wounded in a general action, the only remaining course is to have as many as possible of the ships company, both combatants and non-combatants, trained in first aid methods.

In the British Navy, the regulations now require 30% to 40% of every ships company to be trained in first aid, and appliances for their use in action to be distributed in appropriate positions.

With regard to methods of instruction, different courses are possible; the men may be instructed in classes of 20 to 30 in the sick bay, or other suitable compartment, or the medical officers may visit in turn each fighting position, and give the instruction. In the latter, the principles taught will have to be put into actual practice. Both methods have their advantages, and from my experience I consider that a combination of
the two, will produce the most efficient trained men; first a course of lectures to large classes, and then the system of picking out wounded men from each gun's crew, making the remainder apply First Aid from the Ambulance Pong on the spot and then transport the man in the proper way to the Dressing Station.

With regard to the matter taught, the St John's Ambulance Association's present Text Book on First Aid is admirable. The great point is to teach very thoroughly what is taught, and not to teach more than necessary. Thus, one method of treating each injury, well explained, will be more valuable than imperfect knowledge of several methods. When possible, a clear reason should be given for every step in the treatment, and the nature of all injuries thoroughly explained. The ships' companies of the present day are an intelligent class of men, and time thus spent will not be wasted. For example, the treatment for a fractured clavicle is very much better remembered if the causes of the displacements are first explained, and it is then shown how each displacement is contructed by the treatment adopted. As another example, unless great pains are taken to give a lucid explanation
of the circulation, pupils will invariably, after a short time, consider the tourniquet as a panacea for all forms of haemorrhage. Again, all technical terms should be studiously avoided; thus, although it is very necessary that a first-aid man should know that the main bloodvessel of the arm will be in danger of injury from a carelessly handled broken upper arm bone, it is not at all essential that he should know that these are called respectively the Brachial Artery and the Radial.

The course should be eminently practical. The Bluejackets should be accustomed to use their uniform handkerchiefs as bandages, and to extemporize first-aid appliances out of their accoutrements, and other articles ready to hand. The importance of wearing the cleanest possible underclothing on going into action, should be impressed on them.

With regard to stretcher drill, it does not appear to be essential for all hands to learn the regular drill, but it appears advisable that as many as possible of the ship's company should be exercised in carrying wounded by hand-seats, and in the methods of lifting
them on and off stretchers. This can conveniently be done, without interference with the routine of the ship, by first of all training the Gymnastic Instructors in these methods, and then making them one of the exercises every time a class is mustered for Physical Drill. Lifting wounded is excellent Physical Exercise and the men would at the same time get proficient at Transport Work.

The regular Stretcher Detachment told off for shore work, should of course be regularly drilled, and the Drill adopted should not, I think, be any other than that used by the Army Hospital Corps.

6. General Plans founded on First-Aid Principles:

Since the method of rendering First-Aid at the Fighting Posts is obviously preferable to any plan for transporting wounded during the fighting to any Surgical Station, Armoured or otherwise, for the purpose either of operating or dressing, it now remains to be settled which of the other multitudinous schemes will best utilize the resources, both of Surgeons and Trained First Aid Men, for the maximum benefit to the
wounded.

These plans may be conveniently classified in five categories and considered in detail.

Plan (B). The whole medical staff moving about the fighting parts during action and rendering first aid where required;

This plan exposes the ship in the event of the death or disablement of the Surgeons and their trained assistants, to the risk of losing all the expert surgical talent in the vessel. This risk is very real, when we consider that casualties to those employed in the fighting parts may affect 70% to 80%.

Surely no one, on reflection, could consider that such a loss, at the one time when expert surgical skill is most urgently required, could be in any way compensated by the fact, that the deceased Surgeons had during action, put on a few first aid dressings, which might equally well have been done by a trained boy or ordinary seaman.

To quote again from the International Text Book of Surgery, the Author puts this point very tersely:

"The Surgeon, during the hottest fire, no matter how sorely tempted to do otherwise, should not expose himself needlessly. The Ships Company"
might find out after it was too late, that a living surgeon is much to be preferred to a dead hero, namely, after a battle.

Plan (b.) One portion of the Medical Staff occupied as in the last plan, and during dulls supervising the transport of wounded to a dressing-station occupied by the other portion of the Medical Staff.

This plan, which involves similar exposure of one half only of the Medical Staff, is not so open to adverse criticism as the last, provided that the dressing-station is in a protected position.

The crucial point is now this, whether the ships, in view of a large number of Casualties, can afford to expend one half, or any part, of the expert surgical talent, on an employment which might be equally well accomplished by trained amateurs.

I think here again most impartial critics would answer the question in the negative. A small ship with war complement carries but one surgeon, a medium sized cruiser two, and a battle-ship three.

In the light of recent War Experiences, even were the number increased to 5, I think that a ship's Company would derive more practical benefit
from having 5 energetic surgeons at work after a battle, than 3 at work and 2 swelling the number of dead and wounded, after having perhaps each applied a couple of First Aid Dressings.

To give one example. In the "Matsushima", at the Battle of the Yalu, I gather that there were 3 medical officers. One was disabled, and another temporarily stunned. The wounded do not appear to have been seriously taken in hand till the next day, when it took from 7 a.m. to 10 p.m. to dress them. The want of more medical men was at that time painfully evident.

Plan (C):— The Medical Staff with their stores and instruments in one or more unprotected dressing stations, the stations when multiple being placed far apart; a separate organization of trained First Aid Men with additional stores distributed throughout the fighting Parts.

At one time many besides myself, both in the British and other Navies, thought this a sound plan, but when put to the practical test of war, the results were unexpected and disappointing, as the following extract will show:

Lieut. Loré Petit retiring in Apr. 1900 in the
"Rescue Maruhime," stated that in the "Reina Cristina" at Santiago in the recent Spanish American War, the sick bay was the Surgical Post. An exploding shell killed everyone in it.

Dr. Suzuki, in the Medical History of the Late China-Japanese war, stated that in the "Maruhime" at the battle of the Yalu, on Sept. 17th 1895, one temporary hospital was prepared in the gunroom on the port side of the lower deck aft, and another in the sick berth on the upper deck forward. A 26 c.m. shell penetrated the former, and though it did not explode, it scattered the place, destroying more than half the stores and damaging the medicine chests.

The staff evacuated this, and proceeded to the other station, but a 30.5 c.m. shell, exploding on a neighbouring gun shield, killed by concussion two patients, gave one medical officer concussion of the spine and other injuries, and temporarily stunned another. The instruments there were scattered, and the medical stores almost entirely destroyed.

In addition, 2 ambulance men were killed, and 3 ambulance men and 2 of the Surgeon's party wounded. The next day, in a temporary hospital in the
Captains' Cabin, the wounded, who were mostly also burned, were dressed with an extemporized
ointments of Lime and Engine Room Oil.

In the "Hiei" at the same battle, the Wardroom
on the lower deck aft was prepared as a
surgery, all the staff being there with their
stores. A 305 c.m. shell broke into this com-
partment, destroying the whole of the stores, and
killing or wounding the whole of the staff, and
3 of their wounded patients.

2 Medical Officers  3 Assistants  1 Patient
5 Assistants  killed  wounded.
2 Patients

In the "Saikai Maru", the wardroom,
used as a surgery, was wrecked, and the
surgeon wounded.

Dr. Suzuki in his remarks on the war, states
that division of the staff was bad for the patients,
and recommends more protected position amidships
where possible.

The 3 schemes just mentioned all therefore
appear to have serious drawbacks under modern
conditions of warfare. There still remain two
alternatives, both of which appear to promise more chance
of success, if adopted in the type of ship to which
each is applicable.

Plan (d):— No dressing stations during action, the Contaunts being supplied with multiple depots of First Aid Appliances, and trained in their use. All Medical Staff with their instruments and stores remain in a protected position till aull occurs or the close of the action, when their services will be requisitioned in the fighting part.

This scheme is specially adapted to the smaller class of ships, where there is no adequate accommodation for grouping of wounded in a protected position.

The question here to be decided is where to find a suitable protected position, where the Medical Staff with their stores and instruments may remain under cover till their services are required on temporary or final cessation of firing.

Some small Compartment beneath the armored deck (Electric Store Room for instance) has been suggested. Here they would be comparatively safe from shell fire, but there appear to me to be two serious drawbacks. Firstly, the compartment itself might be flooded by leaks beneath the water-line, by torpedo or shell explosion in its
vicinity, e.g. in the "Tsarevitch" in the present Russo-Japanese war, the explosion of a shell below the waterline set in 13,000 tons of water through rift-holes in loosened & bulged plates. Secondly one of the compartments above might have to be flooded going to fire, or might get filled through shot-holes if the vessel were rolling or settling down at all. In any of those contingencies the position would have to be hurriedly evacuated and most of the stores abandoned in an inaccessible spot.

A more favourable position appears to me to be in the engine-room ladderways. There are protected above by armoured gratings, and in some ships there is a little armour for the protection of the cylinders. The coal bunkers are also in many ships arranged round the boiler-room and engine-rooms and afford protection. There are numerous small platforms for getting at different parts of the machinery for cleaning and other purposes, and instruments and stores placed on one of them would be fairly safe from shell fire, and would not get flooded unless the vessel actually sank, and could readily be got at in cessation of hostilities.
The surgeons and their staff, who in a small ship are not a numerous body, waiting about the ladderways until summoned on deck, would also be handy in the event of any casualties occurring among the engine-room department.

Plan (e): All the medical staff with instruments and stores remaining in one or more protected dressing stations.

The combatants supplied with first aid requisites and trained in their use.

Transport of wounded to the dressing stations or temporary or final cessation of firing.

This scheme is applicable to large armoured vessels. As in the last plan, the vexed question is the choice of suitable protected points in this instance for dressing stations and grouping of wounded, in addition to shelter for the medical staff.

The essential requisites of such stations had better first be considered. In most ships, it is found that where a station fulfils all that is to be desired in certain respects, in others it is not so satisfactory, and a compromise has to be made; the situation chosen however must to be satisfactory, combine in a greater
to less degree the following advantages:

1. As much protection as is compatible with the following:

2. Ease of accessibility from the fighting parts.

3. Possibility of rapid evacuation if necessary.

4. Room for satisfactory examination and dressing.

5. Space for further disposal of wounded under cover in immediate vicinity.

6. Freedom from parties of men carrying on other work.

7. Good light and air supply.

8. Good water supply and drainage.

A position below the waterline has had many advocates. It has, however, in my opinion, only one advantage, viz.: nearly complete security from shell-fire, but this is more than outweighed by the following disadvantages:

1. The protection is only overhead. The contingency of a compartment chosen in this position being rendered untenable by flooding, or by being isolated by flooding of other compartments, as has already been pointed out in plan (d), might if it happened in a large battleship prove even a much greater calamity than in a small Cruiser. It has been suggested that this contingency need not be considered, as
If a ship were torpedoed or flooded from other causes it would be the end of all things. The best answer to that argument is, I think, the accomplished fact, that in the present Russo-Japanese War, there have been different instances of ships being torpedoed, getting into harbour with compartments flooded, resting on the mud, and carrying on fighting from that position. Also accidents to our own Navy in peace show that battleships can be extensively flooded and be submerged many feet below their normal waterline, without sinking altogether.

(2) A second disadvantage is the inaccessibility of this position from the fighting parts. No large hatches suitable for an inclined plane, exist in the lower armoured decks, and the process of getting large numbers of wounded down would be too slow to be practicable during a hull in firing.

(3) If it should be necessary to desert the ship, evacuation would for the same reason be very slow, and flooding might even make the position a death-trap for all the wounded in it. In this connection, it must be borne in mind, that it is important that the arrangements for wounded
should be such as are calculated to inspire confidence, and can be viewed with equanimity by the combatants, otherwise the morale of the fighting force will be impaired. Lieut. Éric Petit, in his article on the Battle of Santiago, already referred to, states that the wounded in all the Spanish ships refused to go below, through dread or inability to escape. He condemns positions beneath the armoured deck for this and other reasons, and recommends that a wide and easily accessible hatch should lead to the posts for the wounded.

In the International Text Book of Surgery, also, the author lays it down that the mental condition of the fighting men should be taken into account, and they should know that wounded will be removed to a place of safety whenever practicable.

With the exception of the submerged torpedo rooms, which for obvious reasons could not be utilized, there are no compartments below the lower armoured deck of sufficient size for the dressing and subsequent disposal of any large number of wounded, and nearly all the available space is crowded with the Ammunition Supply Parties. The air supply under existing conditions
is deficient beneath the armoured deck, any water supply would have to be laid on specially, and suitable drainage arrangements would probably be found wanting.

My own opinion, and that of many others, is that the dressing stations should be above the armoured deck & waterline.

In many of our battle-ships, the whole area between the main and armoured decks within the citadel is practically unoccupied during action, and in this situation in nearly all are placed the bathrooms of the engine-room department. Large laddersways suitable for the erection of inclined planes or lifts, lead from the upper and main decks to this level, and there is also direct communication with the engine-rooms & stokeholds.

There is protection at the sides from coal bunkers with armour outside them, and in all our newer ships built since 1898 there is armour overhead in addition. Protection therefore in our newer ships is complete, and in our older ones considerable.

The position is very accessible, and can be rapidly evacuated, there is ample accommodation both for dressing and subsequent distribution of
wounded; in many ships there is no other work going on in this situation to impede the surgical arrangements; light is as good as below and air better, and there are handy arrangements for water supply and drainage in the bathrooms.

I have heard two objections raised against the use of the bathrooms themselves as dressing-stations.

(1) That they are the most septic places in a ship.
(2) That they will be required for baths for the refreshment of the ship's company during action.

Granted that the first sweeping assertion may be correct, what place in a ship, may I ask, could be more easily rendered aseptic? The roof, walls, troughs and all fittings are of metal, and the floors are of glazed tile.

There is nothing to spoil if the whole place is squirged out with a strong antiseptic solution.

With regard to the second objection, I do not think the difficulty insuperable. Since ship's companies frequently go through a large number of hours hard work without washing, as during coaling operations, sometimes a 20 to 24 hours job; surely they could do the same in battle, if by so doing they could expedite
the treatment of their wounded comrades.

Personally, I am in favour of the use of the actual bathrooms as dressing stations, on account of the washing appliances, handy water supply, drainage, and tiled floor. In cases where the use of the bathrooms is vetoed, I think the next best places are the flats and passages immediately adjoining the bathrooms. The neighbouring large compartments within the citadel, which contain as a rule only bag-racks, can be fitted with cots and mattresses for the further disposal of the wounded after dressing.

With regard to housing one or several dressing stations, it is noteworthy that Dr. Suzuki, in his report on the Late China-Japanese War, after observing that most of the Japanese ships had two surgeries, one forward and one aft, above the waterline, remarks that "division of the staff was bad for the patients, and advocates one safe place amidships.

I think that probably a compromise may be found best, and that a battleship should have at least 4 stations in a group, amidships. Where the construction of the ship admits of it they will be preferably one on the Starboard and one
on the port side of each of two adjoining watertight compartments.

The wounded, as they arrive, being taken to each station in succession, there would be less tendency to congestion and confusion, and a larger number of cases could be dressed in a shorter time than if there were only one station.

The staff and stores being thus divided up, an unforeseen accident to one section would probably not involve the others, while at the same time the surgeons would be near enough to one another to render mutual assistance when necessary.

Section IV. The Working Details of a Scheme for Aid to Wounded in Action in a First-Class Modern Battleship.

1. The Type of Vessel —

The following brief description gives a general idea of the class of ship to which the scheme about to be detailed is adaptable, all portions of the scheme having been practically
tested, so far as can be done in peace time.

A vessel of about 15,000 tons, with a crew of about 750 men.

Main armament of 12 inch guns in an armoured Barbettes at each end of a central citadel, which is armoured to the level of the main deck all round.

Secondary armament of 6 inch guns in armoured casemates on the upper and main decks.

Light armament of 12 pdr. and 3 pdr. guns in unarmoured batteries on the upper and main decks and in fighting tops.

Wide square ladderways lead down from the upper and main decks within the citadel to the lower armoured deck which is just above the waterline.

The space within the citadel between the main deck and lower armoured deck is occupied by watertight compartments with intercommunicating doors. Two of these compartments contain groups of bathrooms, the others contain bag-racks. This part of the ship is practically deserted by combatants during action.

Below the armoured deck in the centre are the Engine Rooms and Boiler Rooms. At each side
is a longitudinal ammunition passage, these being connected by a cross passage at each end. These passages during action are crowded with the ammunition supply parties. At a lower level than these passages are the magazines and the torpedo rooms.

There is communication through the armoured deck with the Engine Rooms and Boiler Rooms by means of ladder ways which open into the bathrooms, and with the ammunition passages by small square hatches just outside the bathrooms through which the ammunition for the small guns is passed up.

In the unarmoured ends of the vessel before and aft the citadel, above the armoured deck there is living accommodation for officers and men, while the space below it is chiefly occupied by stores rooms. This part of the vessel is deserted during action.

2. Preparations for War:

The Medical Officer to arrange with the Captain for permission to have the following arrangements carried out as regards personnel:

(a) About 300 of the Ship’s Company to be trained
in First Aid and methods of Transport of Wounded, according to the Regulations. This number will include:
   All Officers of the Civil Branch.
   All subordinate Executive Officers.
   About 150 Bluejackets and Marines including all those stationed at the small guns.
   About 18 Petty Officers of the Engine Room Department.
   All other non-combatants except those in the Engine Room Department.

(b) All the following to have additional instruction in the rules of Nursing viz.:
   Officers of the Civil Branch, Writers, Stewards, Cooks, Stenographers and Ships Police.

(c) All Bandsmen to be made proficient in the Army Stretcher Drill.

(d) The Engine Room Department to receive special instruction in the treatment of Burns & Scalds.

As regards Material the following preparations to be made:

(a) An inclined plane to be built to fit the skidways leading most directly from the upper and main decks to the vicinity of the Bathrooms. Eight sleighs for wounded, to fit the above inclined plane to be procured or constructed.

(b) Twelve Ambulance Hammocks to be fitted
with guide-ropes and lowering tackle.

(c) Twelve stretchers to be inspected, to ensure their being in working order.

(d) Twenty-six haversacks, for distribution in the gun-positions &c., to be fitted up with a Tourniquet, lint, wool, bandages & scissors. To accompany each of these, a set of 3 wooden splints, a quart bottle of Carrow Oil and another of Concentrated Antiseptic Solution (e.g. Thymanganol Solution) of such a strength as to make a useful lotion when added to 1/2 a mess-tub of water would be safe and serviceable.

(e) Six boxes for use in the Engine Rooms and Boiler Rooms to be fitted up with 2 bottles of Carrow Oil and a liberal supply of cotton wool, lint &c.

(f) For use in the dressing-stations, one dressing-tray for each, containing the usual bandages & appliances and materials for dressings, Ether, Chloroform, Morphine, Starchine & Sal Volatile. Splints, Bandages, Strapping, Scissors, and Measures, to be fitted up & kept ready.

(g) To be fitted up also for each dressing-station a box containing a ready use supply of Port Wine, Brandy &c., Feeding Cups, Mess Basins, Straws, and
a spare stock of Antiseptic Gauze, Lint and Wool.

(b.) The Medical Officer to work out a plan of the Bathroom Hats and adjoining Bag Rack Hat, with a view to the disposal of wounded in hanging cots, and on mattresses on the deck, after dressing. The Carpenter to arrange for fitting additional hammock hooks if required. The Torpedo Lieutenant to provide a circuit of extra lights if necessary.

3. Preparations for Action:

(a.) A working party to be told off to clean the Bathroom Hat, and at least one Bag Rack Hat, of all Bagracks, Chests and other moveable fittings.

(b.) The Sick Berth Staff and any Convalescent patients to thoroughly disinfect these compartments by spraying not with a strong antiseptic solution.

(c.) The Electric Light Party to fit any extra circuits as previously arranged.

(d.) The Sick Berth Staff and Convalescents to remove all cots, bedding, and Bedridden Patients from the Sick Bay to the Bagrack Hat, and also to rig up in the same situation all canvas cots and spare bedding that can be requisitioned from the Boatswain and Carpenter.

They will then remove the Operating Tables, Instrument
Chest, Emergency Dressing Chest, and Medicine Chests to the Bathroom Hats, placing them in different corners; and the spare dressings and utensils and general medical stores to the Bagpouch Hats.

(2) The Sick Berth Staff to distribute an Ambulance Bag with accompanying splints & bottles as arranged, to each of the following parts:

1 to each Fighting Top. Total 4.
1 " Coming Tower " 2.
1 " Barbet " 2.
1 " Casemate " 12.
2 " side of Upper Deck " 4.
1 " " Main Deck " 2.

Total 26.

The petty officers in charge of these parts to see that they are also each supplied with a Mess Kettle and Panikin with drinking water, and a Messhub-half full of water ready for the addition of the Antiseptic Solution for cleansing wounds.

The Sick Berth Staff then to turn over to the Senior Engineer the First Aid Boxes for the use of his department, and lastly to convey to the dressing stations the dressing trays and ready-use boxes.

(3) The Carpenter's Party to rig up the Inclined Plane and place the Sleighs on the Upper & Main Decks.
Ambulance Hammocks with Tackle and General Ropes to be distributed as follows:

1 to each Fighting Top - Total 4.
1 to each Engine Room Ladder - 2.
1 to each After-hatch Ladder - 2.
1 to each Ammunition Passage - 2.
1 to each Submerged Torpedo Room - 2.

Total = 12.

Stretchers to be opened out and placed as follows:

1 at each of the 4 Corners of Upper Battery - Total 4.
1 Lower Battery - 4.
1 Side of the Bathrooms - 2.
1 in each Ammunition Passage - 2

Total = 12.

The Commander to be responsible for the distribution of these appliances above the Main Deck Level.

The Medical Officer to be responsible for those to be distributed below the Main Deck.

(g) The Surgeon's Party (or trained assistants) exclusive of the regular Sick Berth Staff, to furnish each dressing-station with the following articles, obtained from Sick Bay, Mess Deck, Officers' Cabins and Bathrooms viz:-

one Mess Table, one Mess stool, two Chairs, one hot-water can (filled), one large cold-water can (filled), one pannikin,
or enamelled cup, and three basins.

(6.) On the Angle consisting of "action" are trained ambulance men of the crews of the smaller guns not in use in a general engagement, to be distributed in the casemates and other gun positions where first aid may be required. Two trained men also to be stationed in each ammunition passage and two in each submerged torpedo room to attend the ambulance hammocks in those positions.

The Medical Officers, Sick Berth Staff and Trained Assistants, about 20 in number, to repair to the dressing stations and be distributed as follows:

Supposing the number of dressing stations to be five,

In charge of each station one officer,

being either a Medical Officer or a Trained Civil Officer — Total 5

In each station an Assistant Dresser, either

one of the Sick Berth Staff or a Senior Trained Assistant — 5

Four Trained Assistants to each side of the deck to transport the sleighs with wounded from the inclined Plane Platform to the Dressing Stations — 8

One Trained Assistant to unhook the Lowering Tackle from the sleighs — 1

The Junior Trained Assistant to attend on the Senior Medical Officer as messenger — 1

Total = 20
4. The Operation of the Scheme during Action:

(a) As casualties occur, the wounded to receive First Aid where they fall and to be gently moved aside out of the way of the foot of the Combatant.

The medical staff and assistants to remain under cover, or in close proximity to their dressing stations.

(b) At any time during the fighting, men injured below the armoured deck to be at once moved to the dressing stations. If firing is actually in progress, members of the medical staff may with advantage be detached to give assistance below the armoured deck if required.

1. Wounded in Ammunition Passages to be placed in Ambulance Hammock, moved on stretchers to the 12 pr. Ammunition Hatch, and raised by tackle to the Bathrooms.

2. Wounded in Submerged Torpedo Rooms to be placed in Ambulance Hammock, raised by tackle to the Ammunition Passage and then conveyed as above.

3. Wounded in Engine Rooms and Steamhold to be placed in Ambulance Hammock, and raised by tackle and guides through the ladderways to the Bath Rooms.

(c) When a pull in the action occurs, all wounded above the main deck to be moved to the
Inclined Plane, and lowered by the nearest available trained men.

The whole Medical Staff* at the same time to assemble at their exact points at the dressing stations to receive them.

1. Wounded from all parts, who are able to walk, to find their own way below to the two foremost dressing stations, and having had their injuries examined, noted, and when necessary redressed, to pass at once to the foremost bag- racks first, or return to their fighting station according as they may be ordered.

2. The Casemate Doors being opened, the first-aid men to procure sleighs, place wounded from the Casemate on them (Those nearest the Inclined Plane first), move them to the inclined plane and lower them. Each party to wait and hoist an empty sleigh in exchange.

3. Wounded from Barbettes to be carried out by hand to the upper deck & carried thence on sleigh to the Inclined plane.

4. Wounded from Conning Turrets to be carried out by hand and then on sleigh to the Inclined Plane.

5. Wounded from Tops to be lowered by Hammocks over

* If there are 3 or more medical officers, it may be advisable to detach one to proceed to the gun positions to administer morphia and advise on critical cases, but only during the dull.
to the upper deck, and carried thence on sleighs to the inclined plane.

(6) Wounded on arrival at the bottom of the inclined plane, to be carried on the sleighs by the Surgeon's Beaver Parties to the different dressing stations in regular rotation. Here they will be examined, redressed if necessary, tourniquets will be removed when advisable and bleeding points secured. Morphia, Stimulants and Medical Complaints will be administered as required, and the patients finally disposed as comfortably as possible, in cots, or on the deck in the adjoining flats within the Citadel.

(7) The Officer in Charge of each dressing station, before finally disposing of each case, will whenever possible note the Name, Age, Rating, Fighting Station, Home Address, and Nature of wound of each patient, and attach a duplicate to the patient's person (Railway Luggage Labels might prove useful for this purpose).

5. Arrangements after Action:--

(a) Soon after the termination of the engagement, if everything has worked smoothly, a temporary war hospital will in all probability be in existence in the Battery Flats and adjoining Begumeh Flats.
(b) As the Surgeons and Sick Berth Staff will be very fully occupied in surgical work, the following to be placed under the Medical Officer's orders to form a working staff for the temporary hospital to assist in feeding and nursing the wounded, viz.:

One officer of the Accountant Branch
One of the Ship's Stewards Staff
Two Cooks and Four Domestic

Supplemented by extra men from the Ship's Company according to the number of wounded.

(c) If the actual bathrooms have been used as dressing-stations, they are to be evacuated as soon as possible, and a working party told off to clean them out for the general use of the Ship's Company, who will obtain access to them through the engine-room and afterhold ladders, and not through the flat occupied by the wounded.

(d) When all wounded have been treated and temporarily disposed of, the Medical Officer, with the Captain's approval, if there is no immediate prospect of a renewal of hostilities, should select some suitable above-water position for the purpose of carrying out any urgent Operations,
and be sent away thither such stores and instruments as may be necessary. This position may be some undamaged compartment on the main deck, if any remain intact, such as the Sick Bay, Wardroom, or Captain's Cabin, or it may have to be under a temporary canvas screen. In any case it is essential to have more light, air and freedom from traffic than is possible in the lower deck flats.

2. If no resumption of hostilities is imminent, but still no immediate prospect of removal of wounded from the ship, the whole temporary hospital should be transferred as soon as possible to an upper deck position for the purpose of obtaining a maximum of fresh air. Should the number of wounded be large, probably the best plan would be to clear the upper battery from stores, and house in with canvas coverings where necessary.

5. The last stage of the operations will be reached, when boats for the wounded arrive alongside from the hospital ship or shore as the case may be. The removal of wounded from the ship may be effected either by lowering in litter's slights if these are available, or else in the ordinary
service canvas cots suspended horizontally from a spar, and moving out from the boats darts.

Appendix.
The Battleships of 1905.

Whilst the foregoing scheme of Medical Arrangements is more or less applicable to the majority of our Battleships now afloat, the present year has witnessed the commissioning of vessels differing from their predecessors in so many details that a few lines may well be devoted to a short account of their special features.

These vessels, known as the "Edward VII" Class, are the largest war vessels afloat, having a displacement of 16,350 tons.

The upper deck armament consists of four 12 inch guns in two heavily armoured barbette, and four 9.2 inch guns in four strongly armoured revolving guns shields, which completely enclose the guns crew and the breech ends of the guns. There are no fighting tops, and the 12 pr. guns mounted on the upper deck would not be used in a general action.

On the main deck is an armouredbattery
of ten 6 inch guns, partially isolated from each other by athwartship armoured screens projecting inwards from the ship's side.

The vessel has sides armoured all round the water-line, and up to the level of the upper deck, from near the bow to the after end of the citadel.

In addition, the upper, main, and lower decks are all thus armoured.

The space within the citadel between the main and lower decks, as in the former class, is occupied by Bathrooms and Bag racks. The Bathrooms occupy the starboard side of 3 separate water-tight compartments, the port side of the same being vacant except for bag racks.

On the Port Side of the Aftermost of these three compartments is fitted an Ambulance Lift, worked from below by a hand winch, and which can convey patients from either the upper or main decks to this flat.

In the foremost of these three compartments are hatches to which an inclined plane could easily be fitted.

In the after bathroom are sockets in the deck...
for fitting an operation table.

All these compartments are much more roomy than in the previous classes of ships.

The Barbettes have no communication with the upper deck, except through the sighting-holes overhead, the only other means of egress being below through a door two decks below the Bathroom Flat.

The Cominco Tower has also an overhead opening and a ladderway leading down to the deck below the bathroom flat.

The shields of the 9.2 inch guns have doors in rear of the guns, opening on to the upper deck, but no other means of egress.

In considering how these arrangements will bear on the question of wounded in action, the first thing that strikes me is, that almost everybody in action will be behind armour.

In the present Russo-Japanese War, the Isaraelli, which was very severely mauled in her unarmoured parts by the long-range fire of the Japanese, did not however have her armour pierced by a single shell.

Theoretically speaking, therefore, in long-range action, the ships under discussion should have practically no wounded.
Again, at short ranges there should be few casualties on the upper deck, as all the men will be within the barbettes and circular armoured gunshields. There is, however, a possibility that the side armour protecting the 6 inch guns on the main deck may be penetrated by direct hit, when there would be carnage on the main deck.

Also in any position in the ship, and at any range, shells bursting against the sighting holes for the guns would almost certainly cause casualties.

The great increase in the distribution of the armour has revised the question as to the advisability of removing wounded during actual firing, on the plea that it will be better if wounded are removed from the view of their comrades.

I think that the reply to this question will as regards these ships, probably have to depend firstly on the position where the casualties have taken place, and secondly on the range.

(1) Wounded in Barbettes or Conning Tiers could certainly be lowered down the ladderways during firing without further exposure to anybody.

(2) Wounded in the 9.2 Gunshields, could not be removed without (a) opening the Armoured Door,
and (b) Carrying the patient across the unprotected upper deck to the lift.

I think the principle has been pretty well established that this should not be done during firing, and the patient would be better kept inside until a lull.

(3) Wounded in the 6 inch battery during long-range firing would probably consist of isolated cases struck by splinters or stunned by concussion at the sighting position, and while the range was long it might be advisable to remove them at once.

Those wounded at short range, however, by penetration of the armour, would probably be better left where they fell until a lull, or at least until the range increased to safe limits.

With regard to the general scheme for wounded, it need only differ from that already described, in the matter of transport.

(1) The Dressing Station to be in the Battlehuts, which have two armoured decks above them, and are thoroughly protected.

(2) All wounded from the 9.2 inch guns on the upper deck, and the most serious cases from the main deck, to descend by the lift to
the after end of the dressing stations.

(3) All less serious cases on the main deck, to descend by sleighs on an inclined plane to be fitted at the foremost end of the dressing stations.

(4) Wounded from Barbettes and Conning Turret, to be lowered down the ladders by tackle in Ambulance Hammocks to the hold, and then raised in the same way by the nearest hatch to the bathrooms.

(5) Wounded from the Engine Rooms and Boiler Rooms to be similarly raised by Ambulance Hammocks with tackles and guide ropes.

As regards the next ships, therefore, it may be noted (a) that the dressing stations are more roomy and better protected.

(b) That serious cases can be transported by the lifts with a minimum risk of injury.

(c) That the difficulty in transporting wounded from Barbettes and from Engine Rooms and Stockholds without risk of injury has not yet been surmounted.

(d) That the increased distribution of armament will probably materially decrease the percentage of wounded in a general action.

Signed

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