Ronald Searle, watercolour and pen & ink sketch, 1943
'Cholera lines – Thai-Burma Railway'

Improvised transfusion in POW Camps in SE Asia 1942-45

Dr Rod Bailey
University of Oxford

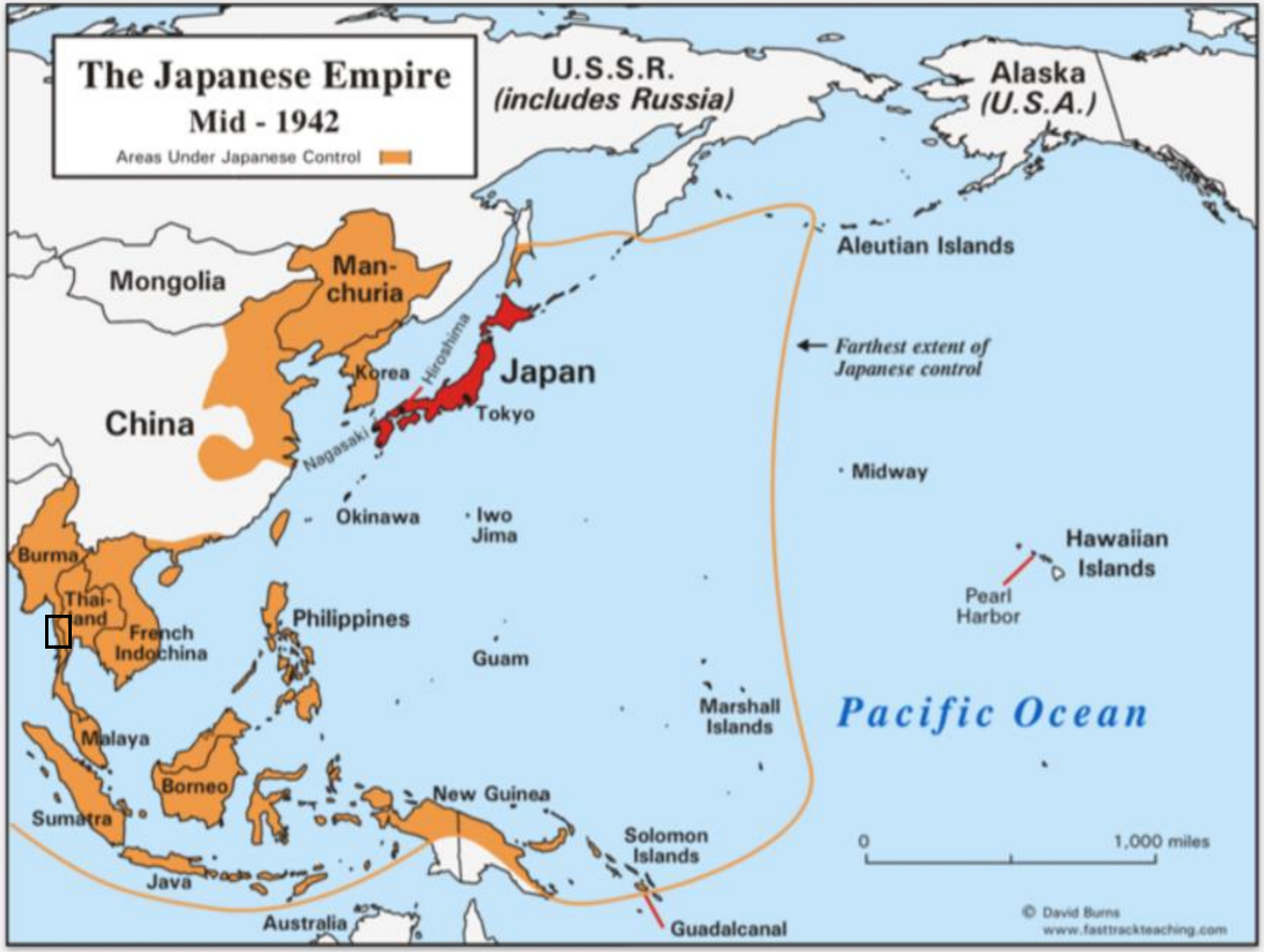
A study in:

- Improvised medicine in a very austere setting (i.e., prison camps run by the Japanese Imperial Army and deprived of all medical supplies)
- Blood vs. anaemia, disease and malnutrition
- Human ingenuity, resilience, pragmatism and psychology

- Why was it done?
- How was it done?
- Who administered it?
- Who gave blood?
- Was it effective?

George Stanley Gimson, pencil sketch of Kanu [sic] lower camp, 10 March 1943, IWM ART 16888

Why was it done?



Why was it done?

Prisoners of the Japanese:

27,000 Americans

60,000 British

20,000 Australians

25,000 Indians

2,000 Canadians

30,000+ Dutch

Held across c.775 camps in Japan, HK, Malaya, Thailand, Burma, 'Dutch East Indies' (Indonesia), Formosa (Taiwan) etc.

Why was it done?

Conditions:

- Neglect, torture and abuse
- Slave labour (e.g. mines, railroads)
- Disease
- Inadequate food
- Inadequate / non-existent medicines

Effects:

Starvation, sickness, accidents, traumatic wounds, etc.

27% of Allied PoWs died/killed in captivity

NX45740 Cpl Claude Carter
2/20 Battalion, AIF
Dysentery

VX43307 Pte Donald Gordon Boyce
2/40 Battalion, AIF
Dysentery, **beriberi, malaria**.

Photographs taken after liberation, Thailand, c. September 1945, TNA WO 222/1388

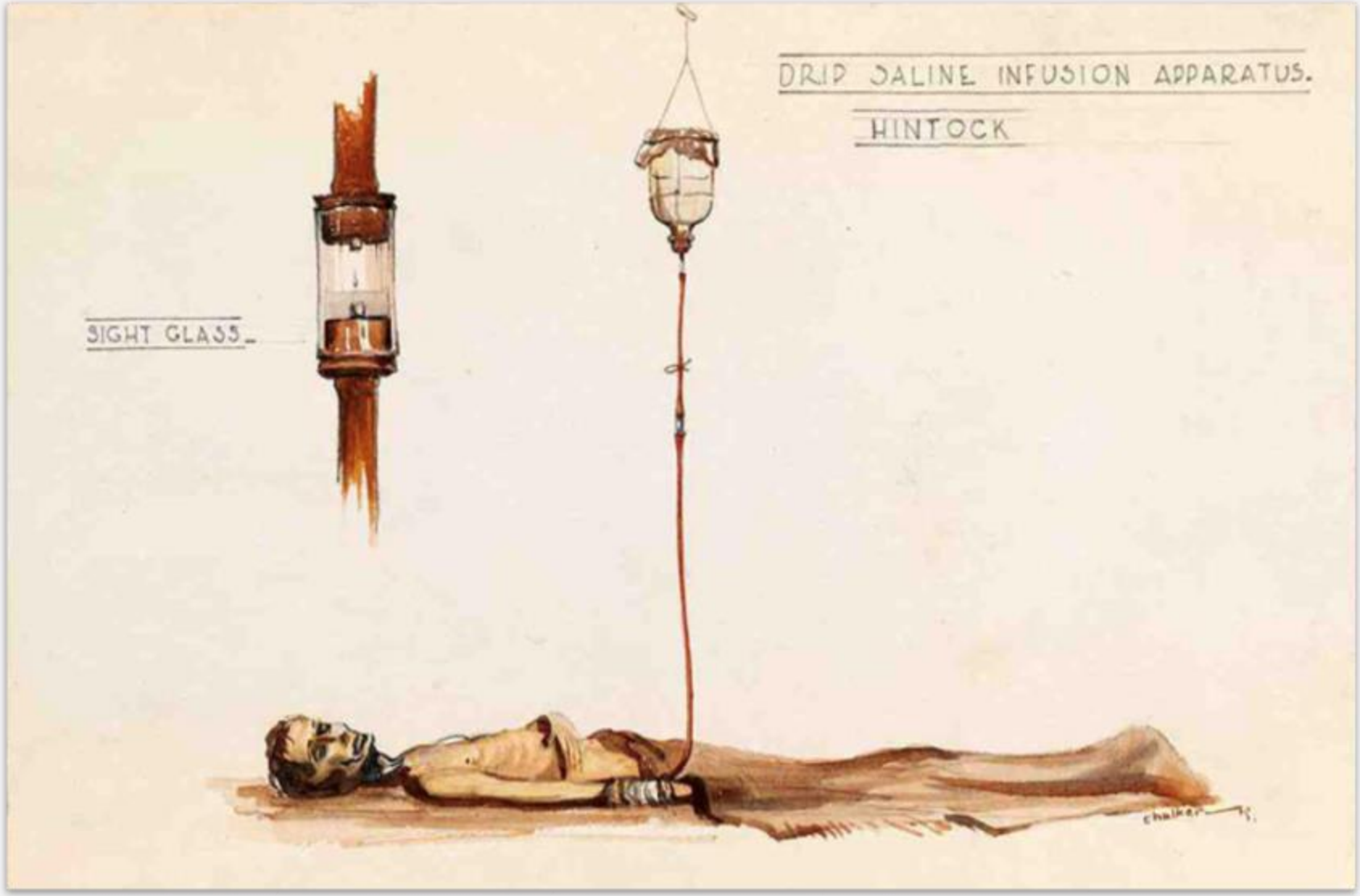
Why was it done?

Why transfusion?

To restore proteins, iron, volume, O2, etc., and thereby counter effects of:

- Haemorrhage
- Anaemia
- Disease
- Malnutrition ('a meal')

"We… worked on the principle that blood is all things to all tissues, being meat to the hungry, blood to the malarious and life-giving fluid to the collapsed and to those losing protein"

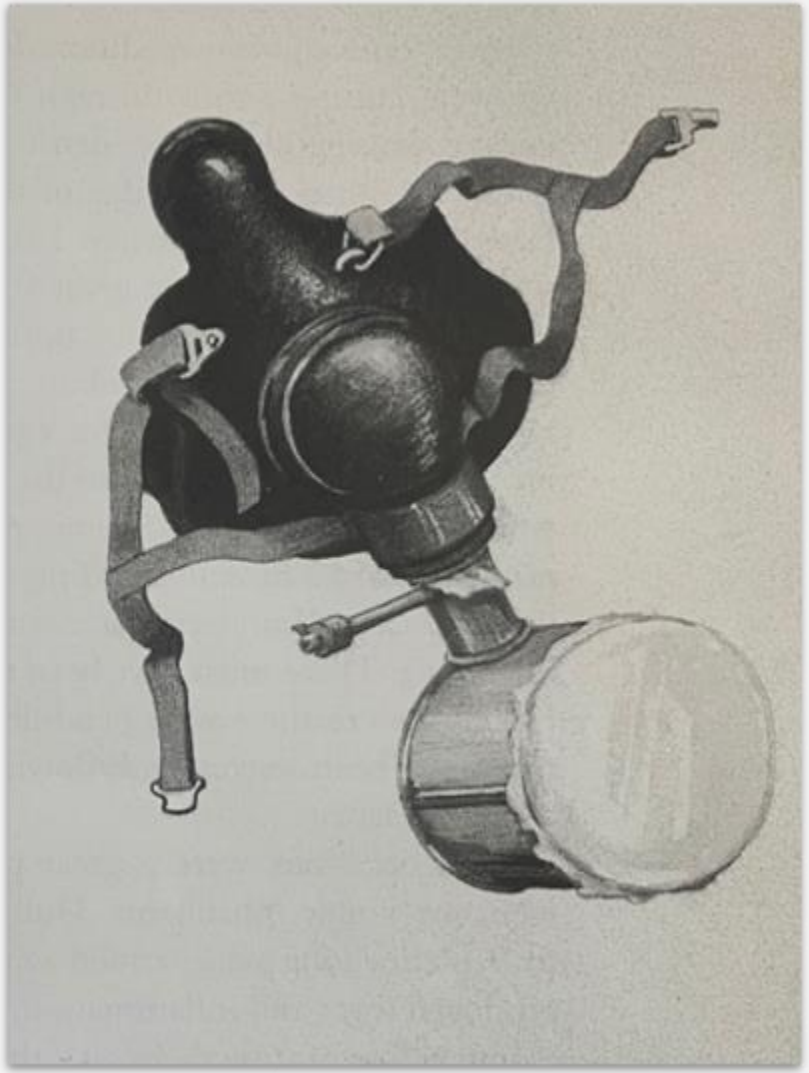


Gnr J. Chalker, watercolour with ink ('Drip Saline Infusion Apparatus'), Thailand, c.1945
A.W. Ong and S. Mathew, 'Surgeons in Captivity: Thai-Burma Railway, 1942-1943,'
World Journal of Surgery 47 (2023) p.603

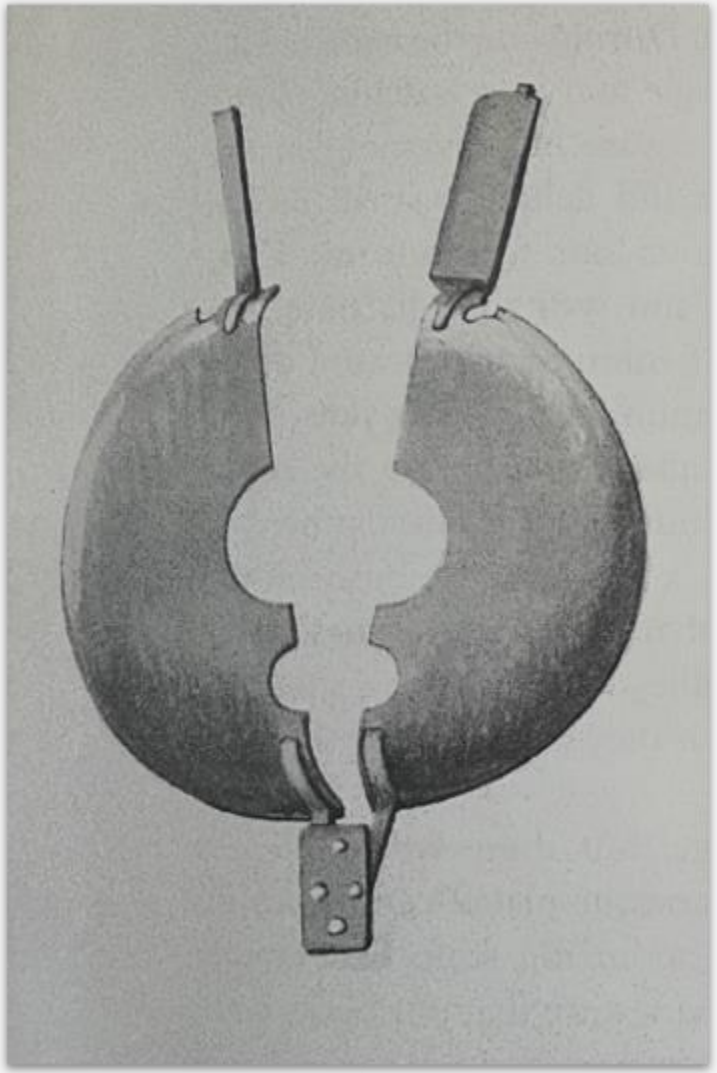
How was it done?

No medical supplies, so…

- Bamboo for operating tables, prosthetic limbs, piping, etc.
- Sharpened spoons for scalpels
- Clothing as dressings
- Saline from rock salt
- Maggots for debridement
- Yeast production for Vit B
- To estimate Hb, N/10 HCl (for Sahli's method) obtained from cases of duodenal ulcer by stomach tube.
- Etc.



Anaesthesia mask made from gas mask and condensed milk tin with gauze cover

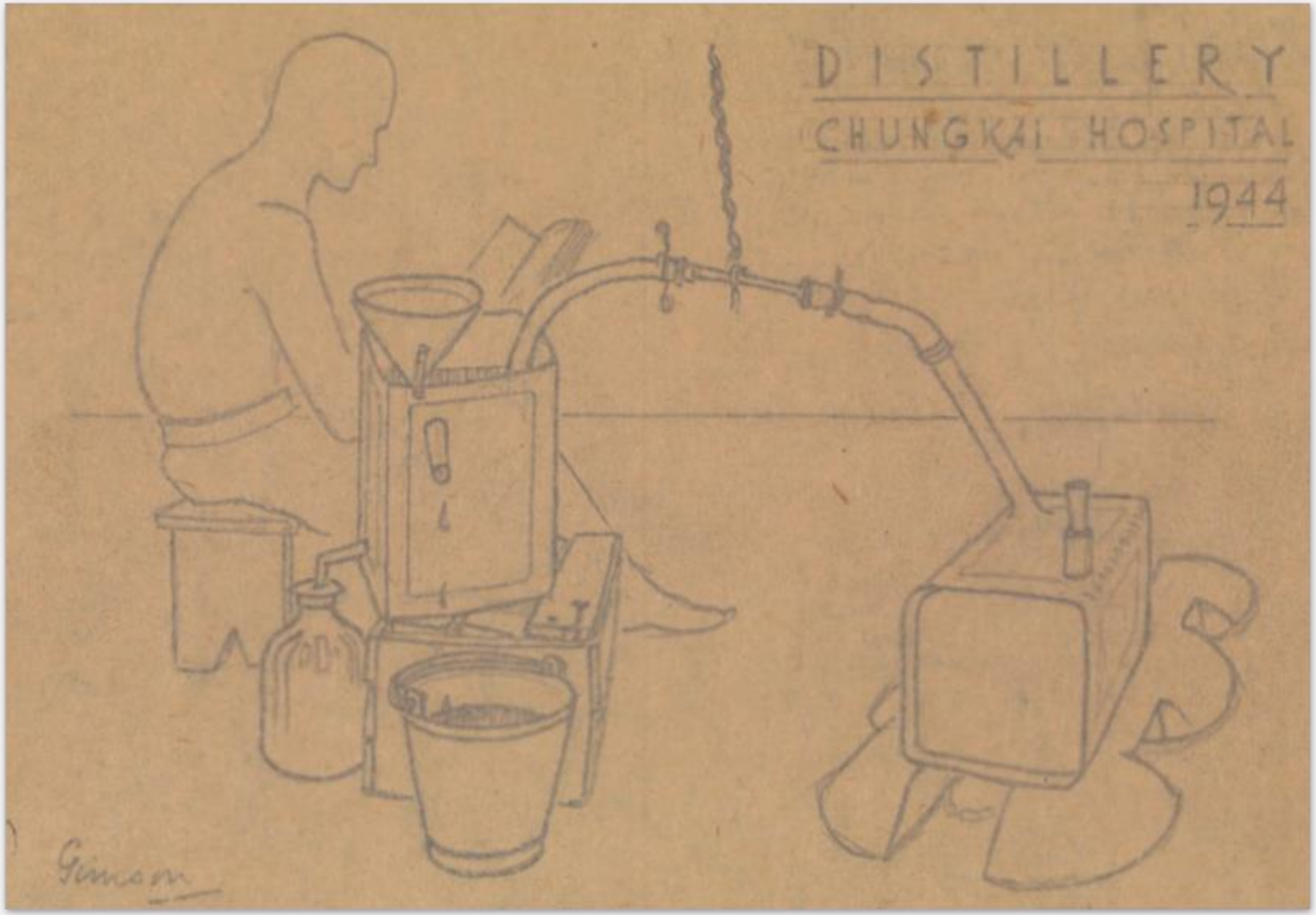


Retractor made from Dutch Army mess tin

From Jack Bridger Walker, *Burma Railway Artist* (Pen & Sword, 1994)

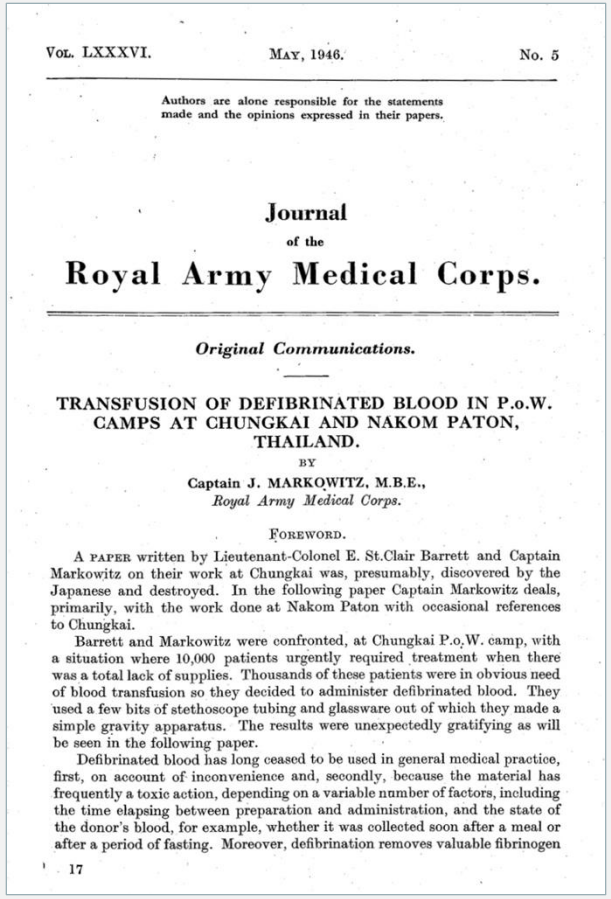
How was it done?

Improvised distilling equipment constructed from kerosene tins, tea chests, buckets, flask, etc.



George Stanley Gimson, 'Distillery, Chungkai Hospital, 1944' IWM ART 16860

How was it done?



VOL. LXXXVI. MAY, 1946. No. 5

Authors are alone responsible for the statements made and the opinions expressed in their papers.

Journal
of the
Royal Army Medical Corps.

Original Communications.

TRANSFUSION OF DEFIBRINATED BLOOD IN P.o.W. CAMPS AT CHUNGKAI AND NAKOM PATON, THAILAND.

BY

Captain J. MARKOWITZ, M.B.E.,
Royal Army Medical Corps.

FOREWORD.

A PAPER written by Lieutenant-Colonel E. St.Clair Barrett and Captain Markowitz on their work at Chungkai was, presumably, discovered by the Japanese and destroyed. In the following paper Captain Markowitz deals, primarily, with the work done at Nakom Paton with occasional references to Chungkai.

Barrett and Markowitz were confronted, at Chungkai P.o.W. camp, with a situation where 10,000 patients urgently required treatment when there was a total lack of supplies. Thousands of these patients were in obvious need of blood transfusion so they decided to administer defibrinated blood. They used a few bits of stethoscope tubing and glassware out of which they made a simple gravity apparatus. The results were unexpectedly gratifying as will be seen in the following paper.

Defibrinated blood has long ceased to be used in general medical practice, first, on account of inconvenience and, secondly, because the material has frequently a toxic action, depending on a variable number of factors, including the time elapsing between preparation and administration, and the state of the donor's blood, for example, whether it was collected soon after a meal or after a period of fasting. Moreover, defibrination removes valuable fibrinogen

17

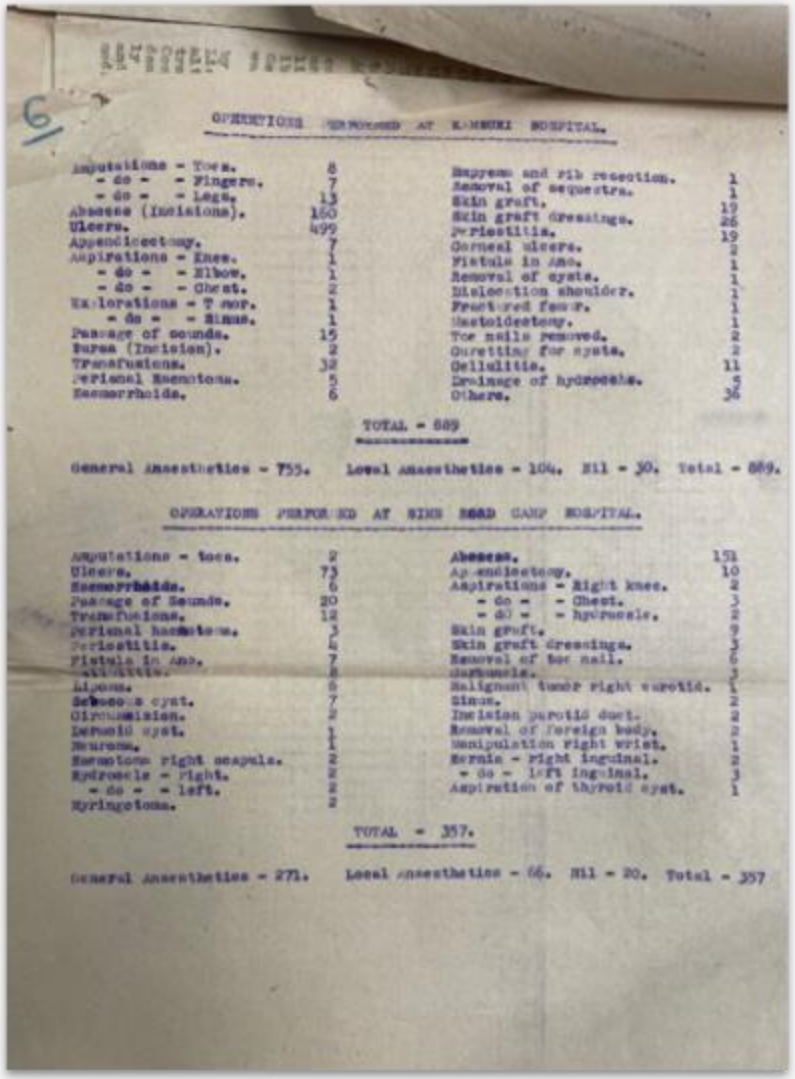
Capt J. Markowitz, 'Transfusion of Defibrinated Blood in P.o.W. Camps at Chungkai and Nakom Paton, Thailand,' *JRAMC* 86 (May 1946)

'Jacob Markowitz, 1945'

Jack Bridger Walker, *Burma Railway Artist* (Pen & Sword, 1994)

Dvr. F. K. Elwell, pencil sketch of the operating theatre at Chungkai POW camp, Thailand, December 1943

How was it done?



OPERATIONS PERFORMED AT KAMUKI HOSPITAL.

Amputations - Toes.	8	Biopsy and rib resection.	1
- do - - Fingers.	7	Removal of sequestra.	1
- do - - Legs.	13	Skin graft.	19
Abscess (Incisions).	160	Skin graft dressings.	26
Ulcers.	499	Periostitis.	19
Appendicectomy.	7	Corneal ulcers.	2
Aspirations - Knee.	1	Fistula in Ano.	1
- do - - Elbow.	1	Removal of cysts.	1
- do - - Chest.	2	Dislocation shoulder.	1
Explorations - Tumor.	1	Fractured femur.	1
- do - - Sinus.	1	Mastoidectomy.	1
Passage of sounds.	15	Toe nails removed.	2
Bursa (Incision).	2	Curetting for cysts.	2
Transfusions.	32	Cellulitis.	11
Perineal Haematoma.	5	Drainage of hydrocele.	2
Haemorrhoids.	6	Others.	36

TOTAL - 889

General Anaesthetics - 755. Local Anaesthetics - 104. Nil - 30. Total - 889.

OPERATIONS PERFORMED AT SIRE HEAD CAMP HOSPITAL.

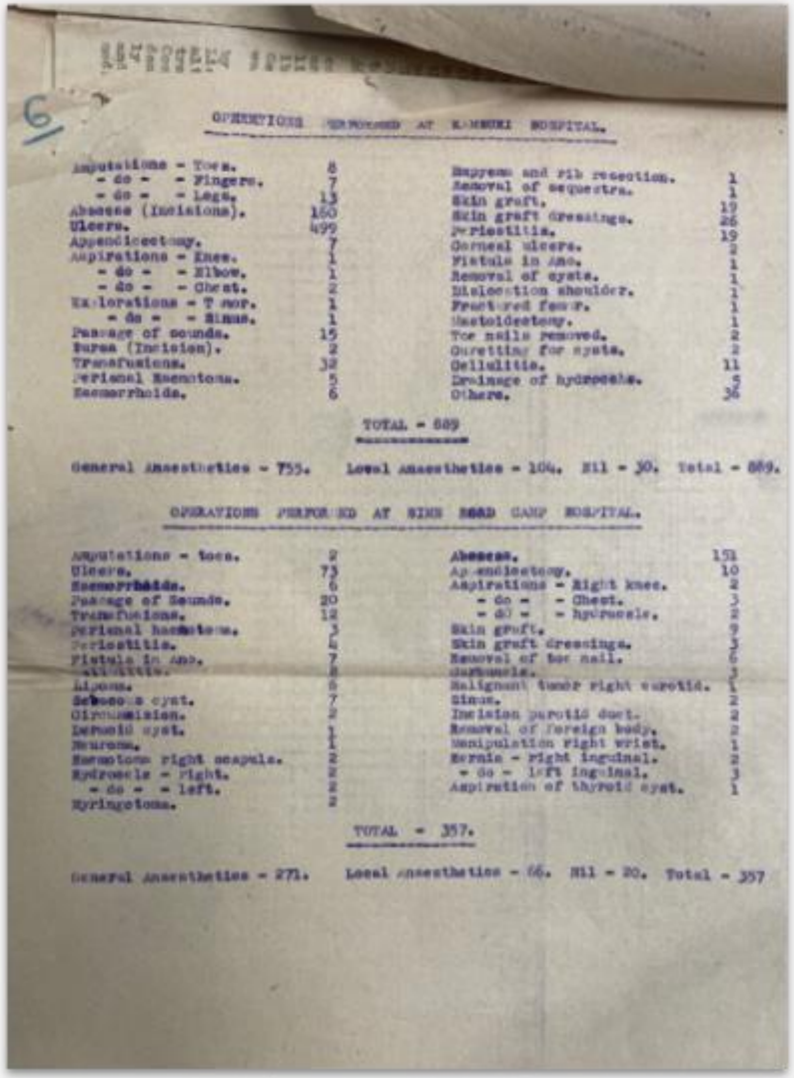
Amputations - toes.	2	Abscess.	151
Ulcers.	73	Appendicectomy.	10
Haemorrhoids.	6	Aspirations - Right knee.	2
Passage of Sounds.	20	- do - - Chest.	3
Transfusions.	12	- do - - Hydrocele.	2
Perineal haematoma.	3	Skin graft.	9
Periostitis.	4	Skin graft dressings.	3
Fistula in Ano.	7	Removal of toe nail.	6
Cellulitis.	8	Carbuncle.	3
Lipoma.	6	Malignant tumor right carotid.	1
Sebaceous cyst.	7	Sinus.	2
Circumcision.	2	Incision parotid duct.	2
Dermoid cyst.	1	Removal of foreign body.	2
Neuroma.	1	Manipulation right wrist.	1
Haematoma right scapula.	2	Hernia - right inguinal.	2
Hydrocele - right.	2	- do - left inguinal.	3
- do - - left.	2	Aspiration of thyroid cyst.	1
Hydrocele.	2		

TOTAL - 357.

General Anaesthetics - 271. Local Anaesthetics - 66. Nil - 20. Total - 357

Major Marten Read RAMC (1940)

How was it done?



6

OPERATIONS PERFORMED AT KANBURI HOSPITAL.

Amputations - Toes.	8	Empyema and rib resection.	1
- do - - Fingers.	7	Removal of sequestra.	1
- do - - Legs.	13	Skin graft.	19
Abscess (Incisions).	160	Skin graft dressings.	26
Ulcers.	499	Periostitis.	19
Appendicectomy.	7	Corneal ulcers.	2
Aspirations - Knee.	1	Fistula in Ano.	1
- do - - Elbow.	1	Removal of cysts.	1
- do - - Chest.	2	Dislocation shoulder.	1
Explorations - Tumor.	1	Fractured femur.	1
- do - - Sinus.	1	Mastoidectomy.	1
Passage of sounds.	15	Toe nails removed.	2
Bursa (Incision).	2	Curetting for cysts.	2
Transfusions.	32	Cellulitis.	11
Perianal Haematoma.	5	Drainage of hydrocele.	5
Haemorrhoids.	6	Others.	36

TOTAL - 889

General Anaesthetics - 755. Local Anaesthetics - 104. Nil - 30. Total - 889.

OPERATIONS PERFORMED AT SIME ROAD CAMP HOSPITAL.

Amputations - toes.	2	Abscess.	151
Ulcers.	73	Appendicectomy.	10
Haemorrhoids.	6	Aspirations - Right knee.	2
Passage of Sounds.	20	- do - - Chest.	3
Transfusions.	12	- do - - hydrocele.	2
Perianal haematoma.	3	Skin graft.	9
Periostitis.	4	Skin graft dressings.	3
Fistula in Ano.	7	Removal of toe nail.	6
Cellulitis.	8	Carbuncle.	3
Lipoma.	6	Malignant tumor right parotid.	1
Sebaceous cyst.	7	Sinus.	2
Circumcision.	2	Incision parotid duct.	2
Dermoid cyst.	1	Removal of foreign body.	2
Neuroma.	1	Manipulation right wrist.	1
Haematoma right scapula.	2	Hernia - right inguinal.	2
Hydrocele - right.	2	- do - left inguinal.	3
- do - - left.	2	Aspiration of thyroid cyst.	1
Myringotomy.	2		

TOTAL - 357.

General Anaesthetics - 271. Local Anaesthetics - 66. Nil - 20. Total - 357

Major Marten Read RAMC (1940)

Major Marten Read RAMC (1945)

How was it done?

Capt. Edmund Hooper, pencil drawing ('Blood Transfusion'),
Chungkai POW camp, Thailand, c. 1944

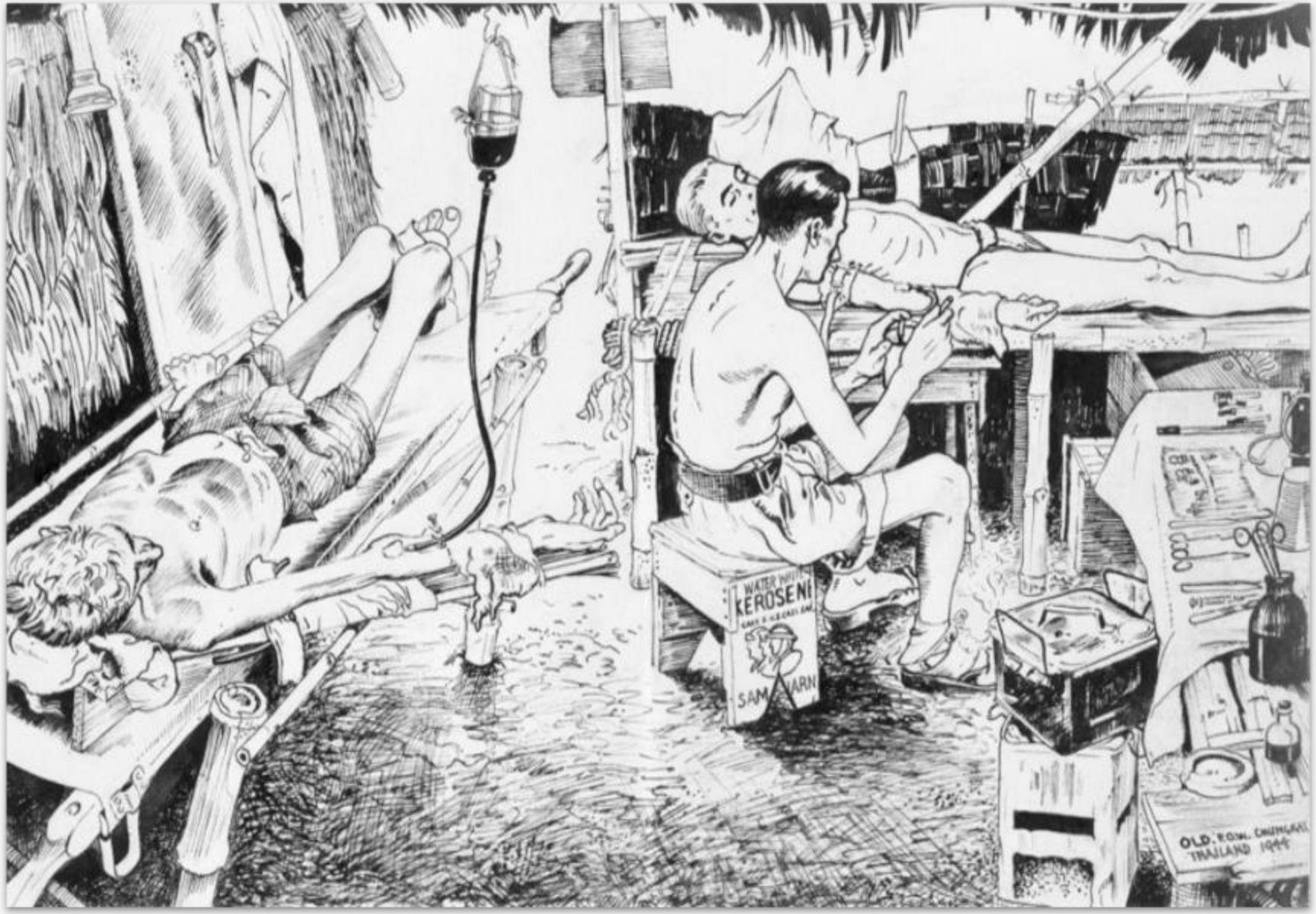
Process:

1. Find donor (WBB)
2. Group donor and patient
3. Draw donor's blood (up to 450cc) into steam-sterilized container (hollowed-out bamboo needle, stethoscope tubing, etc.)
4. Because no anti-coagulant, stir blood with stick/whisk (6 mins: count to 500)
5. Remove stick/whisk (with clots attached)
6. Filter blood through 16 layers of gauze
7. Transfuse immediately (typically: 1/2 bottle/funnel, tube and bamboo needle)

Who administered it?

1. Read and Markowitz
2. All-officer teams
3. All-OR teams

Teams move camp to camp, spreading skills…



Pte A.G. Old, untitled pen and ink drawing, Chungkai POW camp, Thailand, 1944.
H95.61/21, State Library of Victoria.

Who gave blood?

1. Medical staff (e.g., Read; officer in Hong Kong…)

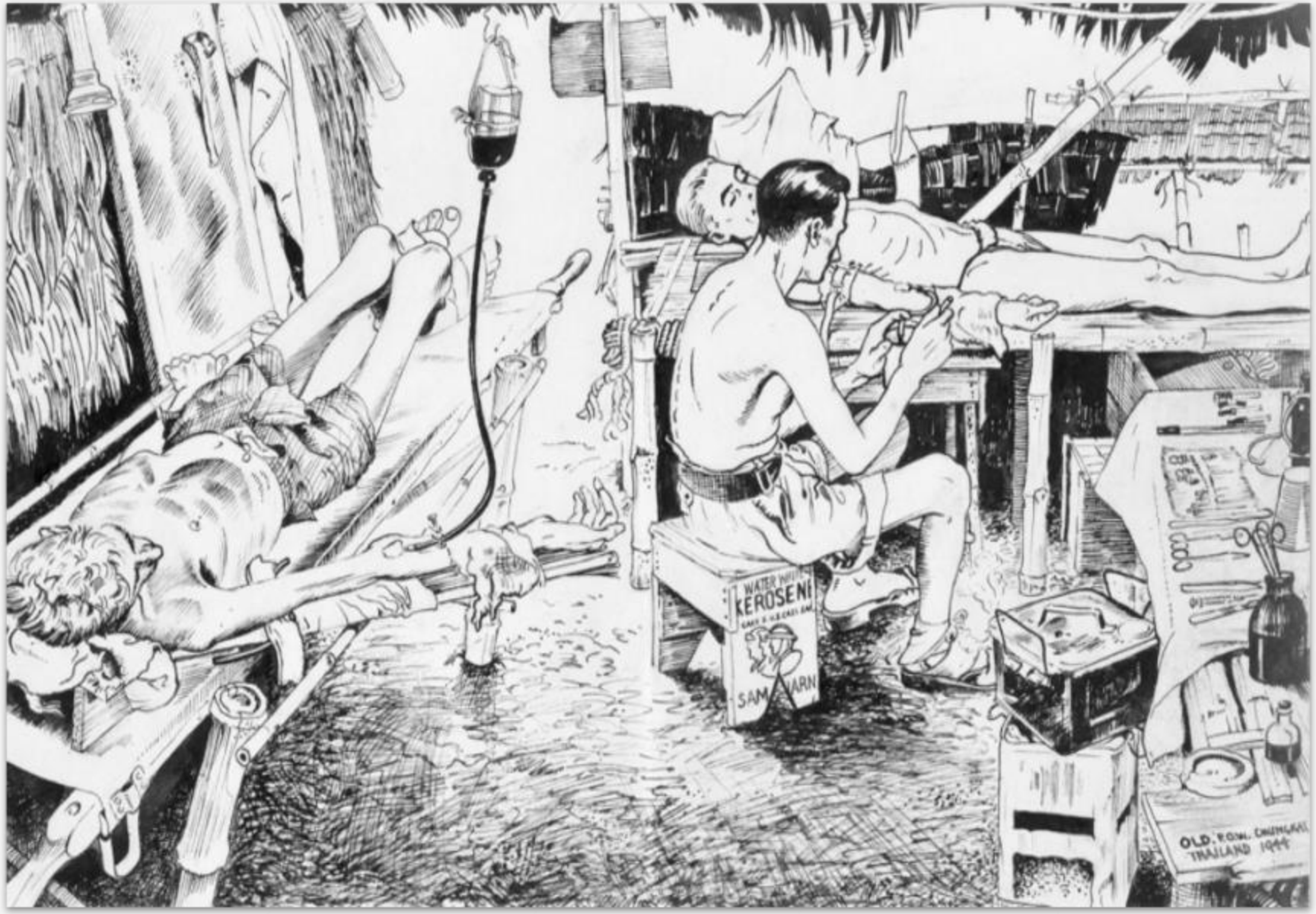
2. Fellow prisoners

Why give blood?

1. Something to be gained?

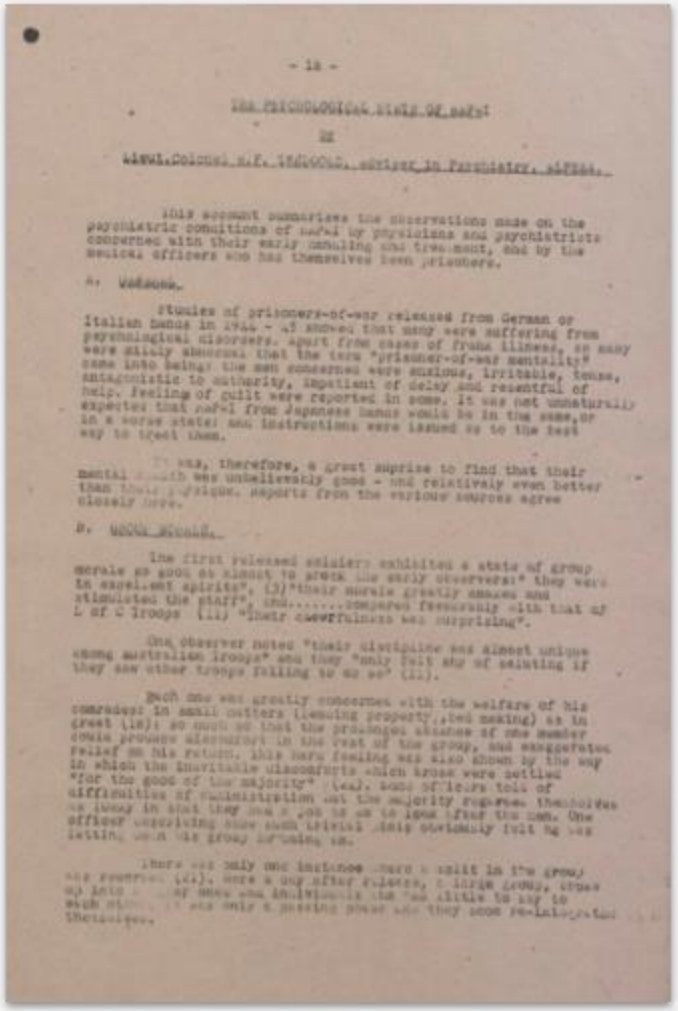
    - Food (e.g., eggs)
    - Commendations
    - 'Insurance'

2. Comradeship…?



Pte A.G. Old, untitled pen and ink drawing, Chungkai POW camp, Thailand, 1944.
H95.61/21, State Library of Victoria.

Why give blood?



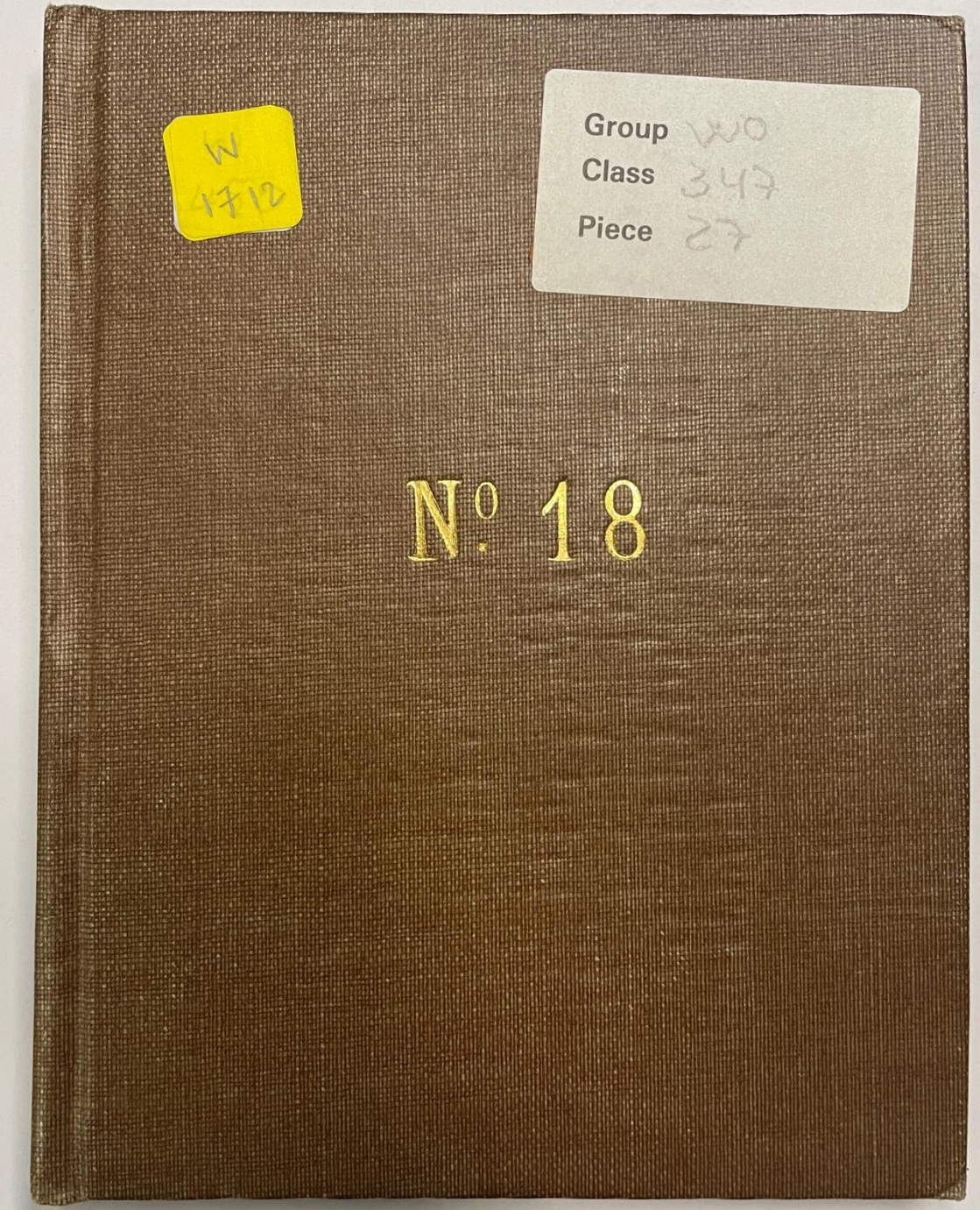
‘Each one was greatly concerned with the welfare of his comrades: in small matters (lending property, bed making) as in great, so much so that the prolonged absence of one member could produce discomfort in the rest of the group…

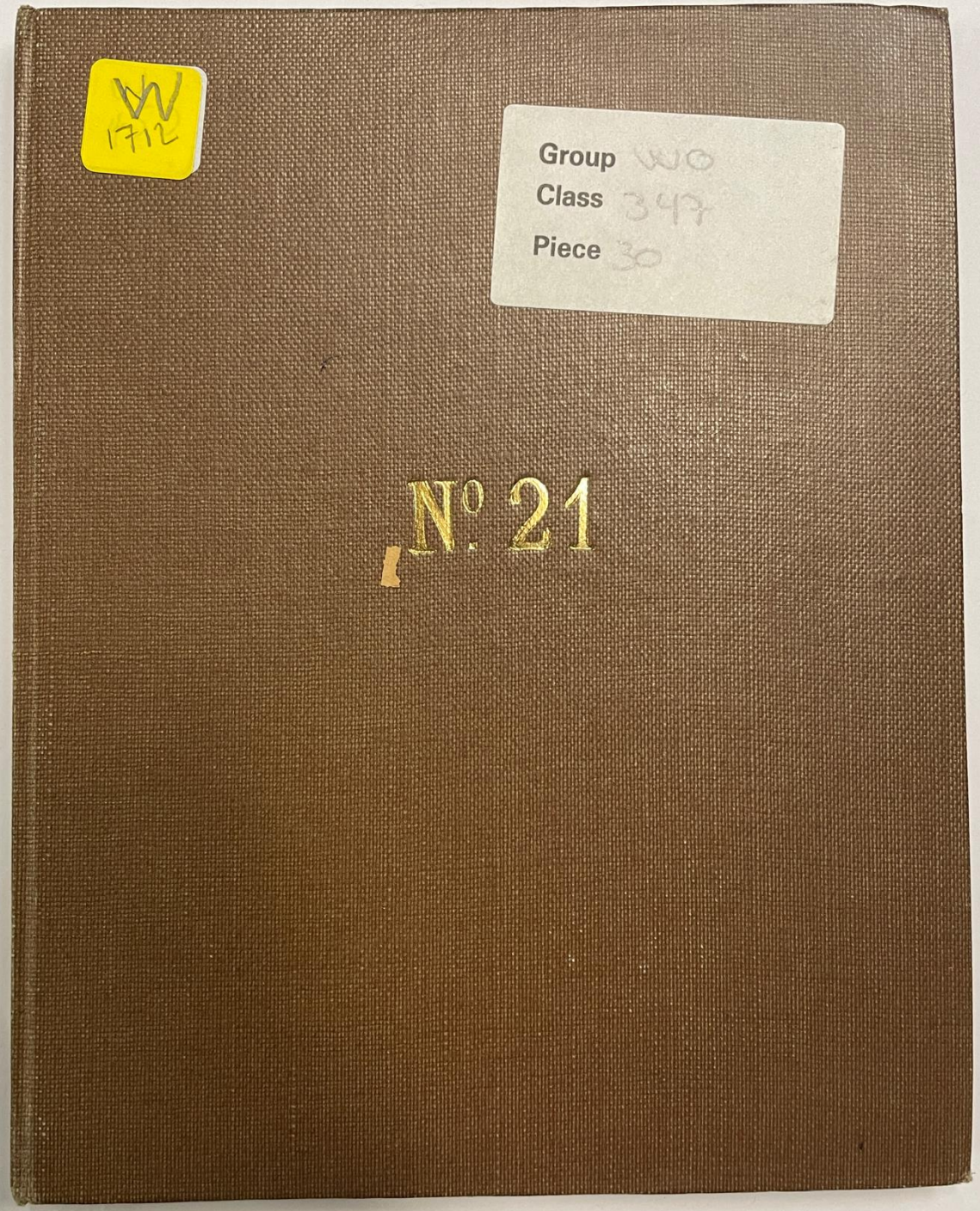
Their constant remark was that they had found work their salvation: work of practically any nature, even the hardest and dullest manual work, but apart from this they had shown incredible ingenuity in improvising all sorts of equipment, wireless sets, surgical instruments, and breweries, from whatever came to hand.

The effort and success in concealing these from the Japs increased their own self-respect.’

‘The Psychological State of RAPWI’
By Lt Col R F Tredgold (Adviser in Psychiatry, ALFSEA)

Attached to report ‘The Health of Recovered Allied Prisoners of War and Internees (RAPWI) in South East Asia Command,’ 1946. TNA WO 222/1286


W
1712
Group WO
Class 347
Piece 27
No. 18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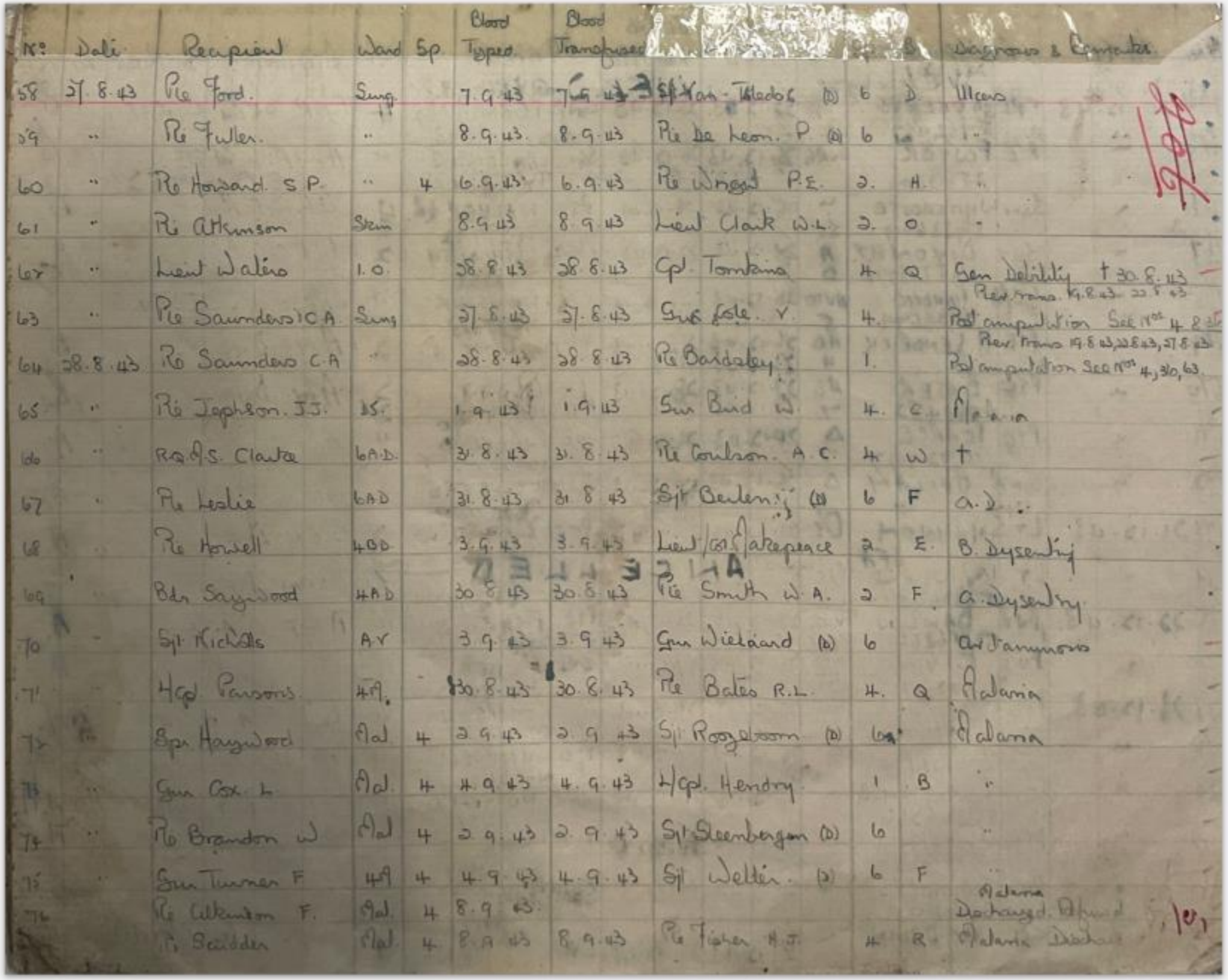
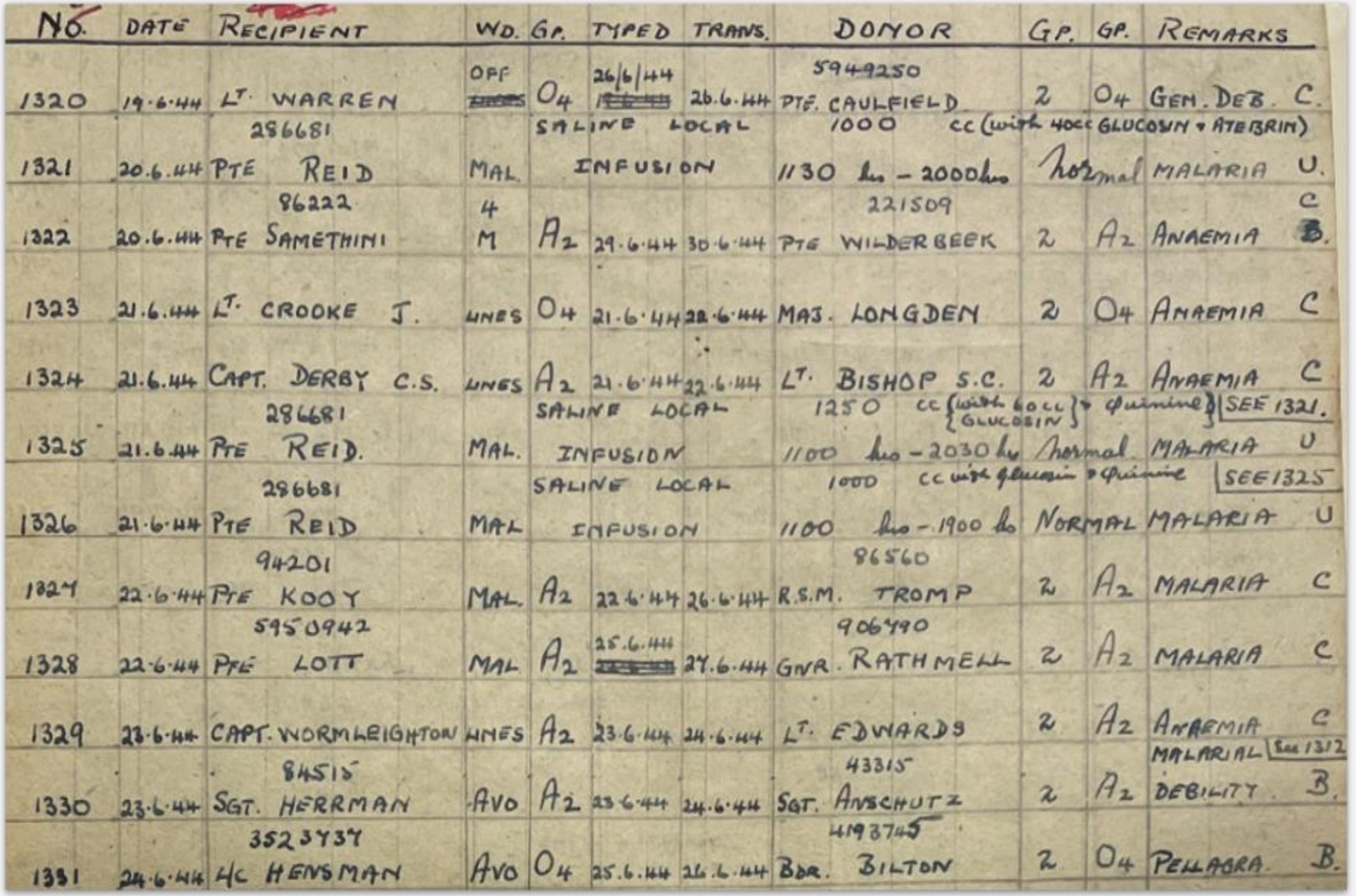
1712
Group WO
Class 347
Piece 30
No. 21



No	Date	Recipient	Ward	Sp	Blood Typed	Blood Transfused	Donor			Diagnosis & Remarks
58	27.8.43	Pte Ford.	Surg		7.9.43	7.9.43	Sgt Van-Toledos (D)	6	D	Ulcers
59	"	Pte Fuller.	"		8.9.43.	8.9.43	Pte De Leon. P (D)	6		"
60	"	Pte Howard. S.P.	"	4	6.9.43	6.9.43	Pte Wright P.E.	O.	H.	"
61	"	Pte Atkinson	Stem		8.9.43	8.9.43	Lieut Clark W.L.	O.	O	"
62	"	Lieut Waldo	I.O.		28.8.43	28.8.43	Cpl Tomkins	H	Q	Gen Debility † 30.8.43 Rev trans 29.8.43 22.8.43
63	"	Pte Saunders I.C.A.	Surg		27.8.43	27.8.43	Gnr Cole. V.	H.		Post amputation See 11th H & 25
64	28.8.43	Pte Saunders C.A.	"		28.8.43	28.8.43	Pte Baldaley	I.		Rev. trans 29.8.43, 22.8.43, 27.8.43 Post amputation See 11th 4, 30, 63
65	"	Pte Jephson. J.J.	25.		1.9.43	1.9.43	Gnr Bird W.	H.	C	Malaria
66	"	R.A.S.C. Clarke	6A.D.		31.8.43	31.8.43	Pte Coulson. A.C.	H	W	†
67	"	Pte Leslie	6AD		31.8.43	31.8.43	Sgt Berlen (D)	6	F	a.d.
68	"	Pte Howell	4DD		3.9.43	3.9.43	Lieut/col Shakespeare	O.	E	B. Dysentry
69		Bdr Sayewood	4AD		30.8.43	30.8.43	Pte Smith W.A.	O	F	a. Dysentry
70		Sgt Nicholls	A.V		3.9.43	3.9.43	Gnr Wieland (D)	6		Av Pneumonia
71		Hcpl Parsons	4th.		30.8.43	30.8.43	Pte Bates R.L.	H.	Q	Malaria
72		Spr Hayward	Mal	4	2.9.43	2.9.43	Sgt Roozeboom (D)	6		Malaria
73	"	Gnr Cox L.	Mal	H	4.9.43	4.9.43	L/Cpl Hendry	I	B	"
74	"	Pte Brandon W	Mal	4	2.9.43	2.9.43	Sgt Steenbergen (D)	6		"
75	"	Gnr Turner F	4th	4	4.9.43	4.9.43	Sgt Welter (D)	6	F	"
76		Pte Wilkinson F.	Mal.	4	8.9.43					Malaria Discharged Ahmednagar 10/1
		Pte Scudder	Mal.	4	8.9.43	8.9.43	Pte Fisher H.J.	H	R	Malaria Discharged

Book 21: 'Chungkai, Blood Transfusions, Recipients and Donors 20.8.43 – 20.5.45,' TNA WO 347/30



No.	Date	Recipient	Wd.	Gp.	Typed	Trans.	Donor	Gp.	Gp.	Remarks	
1320	19.6.44	Lt. Warren	OFF	O4	26/6/44	26.6.44	5949250 Pte. Caulfield	2	O4	Gen. Deb.	C.
				Saline Local			1000 cc (with 40cc Glucosin + Atebrin)				
1321	20.6.44	286681 Pte Reid	Mal.	Infusion			1130 hrs – 2000 hrs	Normal		Malaria	U.
1322	20.6.44	86222 Pte Samethini	4 M	A2	29.6.44	30.6.44	221509 Pte Wilderbeek	2	A2	Anaemia	C B.
1323	21.6.44	Lt. Crooke J.	UNES	O4	21.6.44	22.6.44	Maj. Longden	2	O4	Anaemia	C
1324	21.6.44	Capt. Derby C.S.	UNES	A2	21.6.44	22.6.44	Lt. Bishop S.C.	2	A2	Anaemia	C
				Saline Local			1250 cc {with 60cc Glucosin} + Quinine			See 1321.	
1325	21.6.44	286681 Pte Reid.	Mal.	Infusion			1100 hrs – 2030 hrs	Normal		Malaria	U
				Saline Local			1000 cc with glucosin + Quinine			See 1325	
1326	21.6.44	286681 Pte Reid	Mal	Infusion			1100 hrs – 1900 hrs	Normal		Malaria	U
1324	22.6.44	94201 Pte Kooy	Mal.	A2	22.6.44	26.6.44	86560 R.S.M. Tromp	2	A2	Malaria	C
1328	22.6.44	5950942 Pte Lott	Mal	A2	25.6.44	27.6.44	906490 Gnr. Rathmell	2	A2	Malaria	C
1329	23.6.44	Capt. Wormleighton	UNES	A2	23.6.44	24.6.44	Lt. Edwards	2	A2	Anaemia	C
1330	23.6.44	84515 Sgt. Herrman	Avo	A2	23.6.44	24.6.44	43315 Sgt. Anschutz	2	A2	Malarial See 1312 Debility	B.
1331	24.6.44	3523934 Lc Hensman	Avo	O4	25.6.44	26.6.44	4193745 Bdr. Bilton	2	O4	Pellagra	B.

Book 18: 'Chungkai, Blood Transfusions, Recipients and Donors 21.5.44 – 17.9.45,' TNA WO 347/27

Was it effective?

Difficult to tell.

- Settings far from ideal for data collection
- Priority saving life, not research. No controls.
- Much intercurrent disease, etc.
- Blood often one of raft of measures (e.g., improved diet)
- Impressions only.

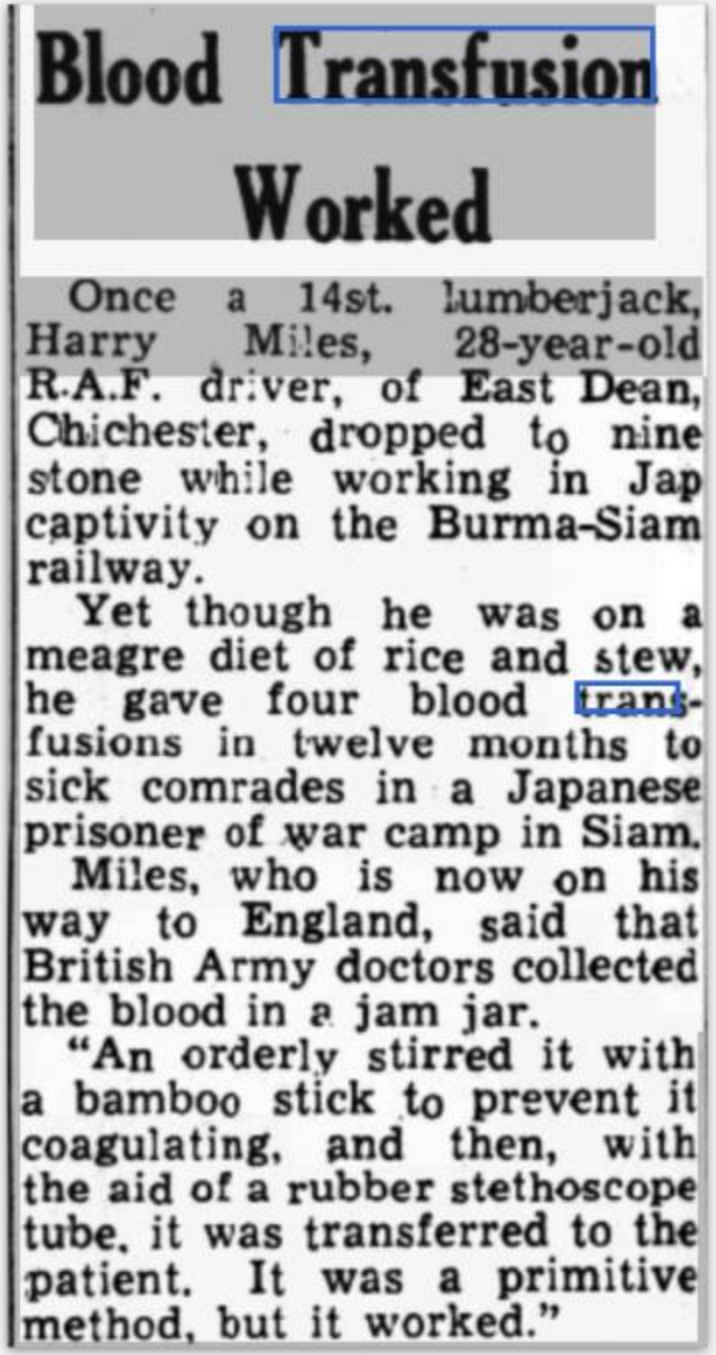
But…

Ronald Searle, 'Siam Jungle Camp, 1943.
Man dying of cholera' IWM ART 15747 98

Was it effective?

MOs confident and consistent about effectiveness of blood transfusions in countering:

- Anaemia
- Malnutrition
- Disease:
  - Camps in Thailand and Burma: **malaria**, **dysentery**, **blackwater fever**, **deficiency diseases** (especially **beriberi** and **pellagra**)
  - Camps in Hong Kong: **diphtheria**
  - Camps in Japan: **pneumonia**
- 'No deaths' in **3,800 transfusions**
- 'Fewer reactions than with citrated blood'
- Morale effect…?



Blood Transfusion Worked

Once a 14st. lumberjack, Harry Miles, 28-year-old R.A.F. driver, of East Dean, Chichester, dropped to nine stone while working in Jap captivity on the Burma-Siam railway.

Yet though he was on a meagre diet of rice and stew, he gave four blood transfusions in twelve months to sick comrades in a Japanese prisoner of war camp in Siam.

Miles, who is now on his way to England, said that British Army doctors collected the blood in a jam jar.

"An orderly stirred it with a bamboo stick to prevent it coagulating, and then, with the aid of a rubber stethoscope tube, it was transferred to the patient. It was a primitive method, but it worked."

Aberdeen Evening Express, 10 September 1945

Was it effective?

'[T]wo studies of ex-FEPOWs in Australia and Britain demonstrated high levels of serological markers of past hepatitis B infection, with rates particularly high in those who had worked on the Thai/Burma Railway… [and] far higher than in the normal population levels. The potential modes of transmission in captivity include blood transfusions and inadequately sterilized surgical instruments.'

D. Robson et al, 'Consequences of Captivity: Health Effects of Far East Imprisonment in World War II,' *Q J Med* 102 (2009) p.93

Q J Med 2009; **102**:87–96
doi:10.1093/qjmed/hcn137 Advance Access publication 14 October 2008

Review

QJM

Consequences of captivity: health effects of far East imprisonment in World War II

D. ROBSON, E. WELCH, N.J. BEECHING and G.V. GILL

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Summary

Though medical consequences of war attract attention, the health consequences of the prisoner-of-war (POW) experience are poorly researched and appreciated. The imprisonment of Allied military personnel by the Japanese during the World War II provides an especially dramatic POW scenario in terms of deprivation, malnutrition and exposure to tropical diseases. Though predominantly British, these POWs also included troops from Australia, Holland and North America. Imprisonment took place in various locations in Southeast Asia and the Far East for a 3.5-year period between 1942 and 1945. Nutritional deficiency syndromes, dysentery, malaria, tropical ulcers and cholera were major health problems; and supplies of drugs and medical equipment were scarce. There have been limited mortality studies on ex-Far East prisoners (FEPOWs) since repatriation, but these suggest an early (up to 10 years post-release) excess mortality due to tuberculosis, suicides and cirrhosis (probably related to hepatitis B exposure during imprisonment). In terms of morbidity, the commonest has been a psychiatric syndrome which would now be recognized as post-traumatic stress disorder—present in at least one-third of FEPOWs and frequently presenting decades later. Peptic ulceration, osteoarthritis and hearing impairment also appear to occur more frequently. In addition, certain tropical diseases have persisted in these survivors—notably infections with the nematode worm *Strongyloides stercoralis*. Studies 30 years or more after release have shown overall infection rates of 15%. Chronic strongyloidiasis of this type frequently causes a linear urticarial 'larva currens' rash, but can potentially lead to fatal hyperinfection if immunity is suppressed. Finally, about 5% of FEPOW survivors have chronic nutritional neuropathic syndromes—usually optic atrophy or sensory peripheral neuropathy (often painful). The World War II FEPOW experience was a unique, though often tragic, accidental experiment into the longer term effects of under nutrition and untreated exotic disease. Investigation of the survivors has provided unique insights into the medical outcome of deprivation in tropical environments.

Introduction

Medical consequences of war are attracting increasing attention. Obvious problems are those of trauma, both physical and psychological. For example post-traumatic stress disorder (PTSD) is now well documented in veterans from the Vietnam conflict[1,2] and more recently, obscurer disorders such as 'Gulf War Syndrome' have been described.[3] Many more recent conflicts have occurred in tropical areas (e.g. Africa and the Middle East), and conditions including various worm infestations[4] and cutaneous leishmaniasis have been described[5] in military personnel from such areas.

The medical consequences of war captivity are less well reported. PTSD and depression has been

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Some conclusions

Incomplete story:

- 200,000+ Asian slave labourers (Burma and Malaya) (approx. 90,000 died)
- Inadequate records (depth/breadth of detail)

But:

Evidence of experiences, health problems, etc., in Japanese captivity

Example of human ingenuity and invention

Example of knowledge transfer in extreme setting

Glimpse of prisoner / donor psychology?

"Donor being bled" [reconstruction, 1945] TNA WO 222/1338