Empyema in Children.

Robert Dundas Helm.

M.B. Cire. 1883.
Empyema in Children.

Having been during my tenure of office as Resident Physician in the Children's Hospital, Edinburgh, during the Summer of 1885, several cases of Empyema, and being much struck with the good results of treatment as compared with that obtained in adults, I have written out notes of six of these cases so as to serve as a text for this Thesis on Empyema in Children.

On the importance of the subject it is perhaps unnecessary to dilate. When we remember how common a disease Pleurisy is in the young and how readily serious effusions become purulent, not only in the Pleural Cavity but in various other joints as well. The Knee joint for instance.
As a proof of the frequency of pleural effusions becoming prevalent I mention the fact that 142 cases of pleurisy occurring in the practice of Dr. Goodhart of London in 71 the effusions were simple in their nature while as many as 78 were purulent, and of these Empyema the left side was four times more often affected than the right.

In the following pages I have first of all written out full notes of the cases I had under my charge in the Hospital concluding with some remarks on the Diagnosis and Treatment of Empyema generally.
Case I.

Susan Cunningham, aged 2 yrs. 3 months admitted to Children's Hospital June 18th 18-

History: Patient admitted for pain in chest, short dry cough, rapid breathing and general weakness.

Present Illness began at Christmas last, with Inflammation of the Left Lung. After a month a fluid formed in the chest and she was talled twice on the first occasion 5 oz of pus were withdrawn and a second time a week ago 11 oz. were drawn off. She was much exhausted after the operations.

Previous illnesses: She had scarlet fever 10 months ago and also an attack of Pertussis which has left her subject to Bronchitis. She is reported to have had Inflammation of the Lungs several times.

Condition on admission: Patient is a pale, fair-headed child.
very anemic looking, thin and flabby. Not well grown for her age. No sign of rickets, no glandular enlargements.

Respiratory System. Left chest bulges considerably in mammaillary region. Intercostal spaces obliterated on the left side, and there is also less movement on that side during respiration. Some edema of left side. Vocal fremitus absent, but little marked on either side. Half an inch difference in measurement of the two sides. The left being larger.

Percussion on left side dull throughout. The note being of a peculiar wooden character.

Auscultation. The respiratory murmur is weak and distant, no accompaniment. While on the right side the breath sounds are much exaggerated.
Internally on percussion of Left side the note also wooden from apex to base. Vesicular murmur weak and distant. Close to right distant and brachial - no accompaniments.

On Right side Respiratory sounds exaggerated but no other abnormality. Respiration on admission were 42 per minute.

Circulatory System. No aper beat visible. Faint pulsation can be felt in the Epigastric region at lower end of sternum, but at no other place. On auscultation heart sounds normal but more distinct to right of sternum. Pulse weak compressible, rapid. 124 per minute.

Other system presented nothing abnormal.

June 23rd. To day Dr. Playfair incised the chest wall 6 inches of greenish thick pus evacuated
A preliminary puncture with the hypodermic needle was made and
the chest was incised between the 7th and 8th ribs at a point
about one inch posterior to a line perpendicular to inferior angle
of scapula. The hypodermic needle had been first inserted about an
inch anterior to where this incision was made, but no pus got
however on trying further back it was found. An incision
1½ in. long was made. The pus flowed very freely at first and
breathing became somewhat embarrassed but soon became
quieter. Child weak and low for a few hours after the
operation, but rallied in the evening and passed a good
night. Dressings changed in the evening and a large quantity
about 3½ pints found to have
escaped & saturated the dressings
(If salicylic wool only)
The incision was made under
thyreine & corrosive sublimate solution
and a good sized piece of
red india rubber tubing inserted.
chloroform was the anaesthetic
used.
25th June. Patient very well this
morning. Breathing quietly. Little or
no discharge on dressings and tube
pushed out considerably. On examin
ation with probe the opening between
the ribs found to have closed. She
was again put under chloroform,
wound reopened and tube reinserted.
Very little pus escaped. But a
piece of firmly organised lymph
was withdrawn. Heart no apex
beat detected by inspection or
palpation. Heart sounds still
heard more to right of sternum.
25th June. Passed a fairly good night. Looks well this morning. Sitting up in bed and breathing freely. Temperature sub-normal. Very little discharge on dressings. Tube removed cleaned and reinsered. No pieces of lymph could be grasped by the dressing forceps. On percussion on the left side note very resonant throughout, varying but little from the note elicited on the right side. On Auscultation vesicular breathing all over left lung and little different from right side. Patient is getting full diet. Beet tub egg cream 3 ounces of port, malt and cod liver oil.


27th July. Went on well till 2 days ago. Temperature rose to parter over 100. Discharge up to this time very small but is now slightly frothy.
Yesterday there was almost no discharge. It was thought that tube, which a few days previously had been shortened did not now enter the pleural cavity. With a little manipulation a pair of Keary forceps was pushed through opening and about 1 oz. of purulent pus evacuated. A larger piece of tube inserted, air passing freely through tube in respiration. To day Left chest found to be dull on percussion from apex to base anteriorly. Hitherto mistake had kept remarkably good fine incision was made. On auscultation distant tubular breathing. Posteriorly note not so dull as originally but less resonant than 2 days ago. Pressed to day, tube taken out. Cleaned end reinserted with some difficulty, hence child somewhat ill nauseated by the
necessary manipulations. There was not much discharge on the dressings, but pus flowed freely on replacement of the tube.
2nd July. Tube found to have come out. On probing the opening unsatisfactory, and of a calculate nature. Chloroform was administered and the opening enlarged so that it now led directly into pleural cavity, a much larger piece of tubing (about 4 inches) was placed in the cavity, about 8 oz. of pus escaped. The physical signs much improved. Note becoming resonant but centering naturally.
3rd July. Improved. Dressed last night and this morning. Moderate amount of discharge on the dressing and no discharge welling out during dressing.
4th July. Still improving. Dressed considerable amount of discharge.
A thin watery character
Tube shortened 1/2 inch.
6 th July. again dressed much
less discharge, further shortening
of tube (~1/2 in). a good note on
percussion both anterior & posterior.
8 th July. Chest dressed daily.
14 th July ordered twice
daily. also hot wine.
15 th July. Discharge continued
much the same price last week.
about 3/4 of healthy looking pus
after each dressing (daily).
General health has kept fairly
good. taking nourishment well.
Physical signs much the same.
17 th July. Not so well. Respiration
80 per minute laborious & accompanied
with an expiratory moan. no cough.
great abdominal flatulent
distension. no change in chest
physical signs. she has been
sick & vomiting. the bowels moved.
twice during the night. Mottled pale, but not watery. Was ordered a
peritoneal wash by the abdomen and
assafetida injection. Bill regulated.
It was thought better not to distinct
dressing at present. To be dressed
in evening. The mother insisted
on removing the child this after-

<table>
<thead>
<tr>
<th>Date</th>
<th>Temperature (F)</th>
<th>Temperature (C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>June</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>98.6</td>
<td>37.0</td>
</tr>
<tr>
<td>19</td>
<td>99.5</td>
<td>37.5</td>
</tr>
<tr>
<td>20</td>
<td>101.2</td>
<td>38.4</td>
</tr>
<tr>
<td>21</td>
<td>101.1</td>
<td>38.4</td>
</tr>
<tr>
<td>22</td>
<td>100.6</td>
<td>38.1</td>
</tr>
<tr>
<td>23</td>
<td>99.5</td>
<td>37.5</td>
</tr>
<tr>
<td>24</td>
<td>100.8</td>
<td>38.2</td>
</tr>
<tr>
<td>25</td>
<td>101.2</td>
<td>38.4</td>
</tr>
<tr>
<td>26</td>
<td>101.1</td>
<td>38.4</td>
</tr>
<tr>
<td>27</td>
<td>100.5</td>
<td>38.1</td>
</tr>
<tr>
<td>28</td>
<td>100.8</td>
<td>38.2</td>
</tr>
<tr>
<td>29</td>
<td>101.2</td>
<td>38.4</td>
</tr>
<tr>
<td>30</td>
<td>101.1</td>
<td>38.4</td>
</tr>
<tr>
<td>31</td>
<td>100.6</td>
<td>38.1</td>
</tr>
<tr>
<td>July</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>99.5</td>
<td>37.5</td>
</tr>
<tr>
<td>10</td>
<td>100.8</td>
<td>38.2</td>
</tr>
<tr>
<td>11</td>
<td>101.1</td>
<td>38.4</td>
</tr>
<tr>
<td>12</td>
<td>100.6</td>
<td>38.1</td>
</tr>
<tr>
<td>13</td>
<td>101.2</td>
<td>38.4</td>
</tr>
<tr>
<td>14</td>
<td>100.8</td>
<td>38.2</td>
</tr>
<tr>
<td>15</td>
<td>101.2</td>
<td>38.4</td>
</tr>
<tr>
<td>16</td>
<td>101.1</td>
<td>38.4</td>
</tr>
<tr>
<td>17</td>
<td>100.6</td>
<td>38.1</td>
</tr>
</tbody>
</table>

Observations taken at: A. M. condu. P.M.

PUBLISHED BY HARVEY & REYNOLDS, LEEDS.
twice during the night. Motions pale, but not watery. Was ordered a
peritoneal stake to the abdomen and assafoetida injection, both regulated.
It was thought better not to disturb dressing at present. To be dressed
in evening. The mother insisted on removing the child the after-
noon, its condition much the same as in the morning. The injection
acted well moving bowels freely, but not much flatus passed.

(Received word from the mother that the child died next day)
Case II.

Alex Laidlaw, ael. 9, admitted to July 16, 83, from surgical wards of Royal Infirmary to Dr. Mayfair's wards, Children's Hospital.

History. Patient took ill six weeks ago with inflammation of left lung. Was ill for 3 weeks, then fluid formed. Was sent to Infirmary where chest was aspirated twice. On the first occasion 35 oz of pus withdrawn and on the second aspiration 30 oz.

Patient had scarlet fever 2 years ago, but no other illnesses. Parents both healthy. Of a family - 2 dead, one of bronchitis, the other of scarlet fever.

Rest of family healthy.

Chest broad & well shaped. The interscalare spaces not visible on the left side—well marked on right.

Left chest almost immovable during respiration. Vocal fremitus absent on left but quite easily felt on right side.

Left chest at middle level measure 13 1/4 in. Right side measures 12 3/4 in.

Percussion—continually on left side 60°, is dull throughout. Sound being high pitched wooden in character. resembles the note of pleuritic effusion.

On right side. Note somewhat hyperresonant.

On Auscultation on left side, at chest 8 in., for about 3 inches downward there is distant tubular breathing 8 in this area an occasional medium sized Crepitation is heard. Below this area & gradually as you approach the base of the lung, the breathing becomes feeble, but nowhere is it absolutely absent.
On right side. Exaggerated juvenile breathing only to be heard.

Perturally. On percussion the note is of the same wooden nature as left side or anterior — on right side note hyper-resonant.

Auscultation — distant tubular breathing all over left lung, but especially well marked close by side of spine from apex to base. Vocal resonance of a well marked egophonic character on the same area. No crepitations or other accompaniments.

On right side. Exaggerated juvenile breathing.

Heart. Indistinct pulsation seen in epigastrium. Slight heaving pulsation to be felt immediately below lower end of sternum on deep pressure, but nowhere else. Percussion the dull note of the left side of chest is found extending 1/2 in. from right edge of sternum just where 5th & 6th ribs meet.
that bone tenderness also in Epiphysium.

Assessment - Heart sounds weak but otherwise normal. In Mitral area they are distinctly less loud than at lower end of sternal & over 5th costal cartilage.

Digestive System - Lips dry & cracked
- Teeth very irregular & marked decayed.
- Tongue covered with thick white fur moist. Lungs & thighs normal.

Wrist also normal.

July 19: The chest aspirated bet.
The 8th rib about 1 inch below lower angle of Scapula of left side and 9th dark coloured, acetotic almost chocolate coloured pus drawn off.

The skin was previously frozen & patient had no pain. After aspiration posteriorly there seemed little difference in physical signs but anteriorly the note of after 8 for 2 inches down was distinctly more resonant and on Auscultation the breathing was
Leaves less distant and more of the normal juvenile character. No change in heart sounds.

July 20th. Although the temp. had fallen to 99, last night the chest is found to have filled up again. Buliness absolute from after to base lost back & front & his breathing at after again of the distant tubular nature.

July 21st. Aspirated again and 10.03 1 greenish colored Sweet smelling gas drawn off. After aspirating chest found to have cleared on percussion down to level of pectoral muscles.

Laterly lower than this almost to level of lower angle of scapula. Auscultation breathing audible over the cleared area. 8:30 p.m.

July 22nd. Chest evidently filled again. Physical signs identical with those before aspiration.


July 27th. Patient doing well, was dressed twice yesterday. To day decidedly less discharge and tube was shortened 1/2 an inch. Patient now to be dressed once daily.

Percussion note now resonant all over the chest of the Respiration motion is almost normal in character on the left side.
Left side of chest very good & stout but little

Note has always been found displaced

Falls of weight
August 5th. Going on well, discharge much less. Tube shortened 1/2 inch. Still being dressed daily.

August 6th. Steady improvement. Almost no discharge. Tube still maintained, but difficult to keep in position. Pulsation in percussion all over left side of chest very good, but little different from that on right side. Intercostal spaces now all marked. Heart still no after beat or pulsation to be seen or felt anywhere. No dulness now to right of sternum. Heart sounds normal.

August 8th. For last 3 or 4 days, the tube has always been found displaced and lying quite out of wound, and difficulty in inserting it. The discharge has ceased, so it was deemed advisable to remove tube.

Sept 11th. Patient is now quite well and goes to Convalescent Home to recover. Has gained greatly in weight.
Chest measurements. Left side 12½ in.  
Right side 12¾. The left side  
having fallen in 3/4 of an inch.  

On palpation. Expansion seems about 
equal on both sides. Both lungs  
fairly well marked on either side.  

On percussion, base is rather hyper-  
resonant over left after anteriorly -  

somewhat less impaired over lower  
third of left lung posteriorly. On  

Auscultation anteriorly breathing rather  
feeble over left after. posteriorly rather  
feeble on left base than right base.  

Heart. No after beat to be seen  
or felt. Sounds normal.  

Observations taken at A.M.
Case III.

Aqns G. Young, aged 4½, admitted to 1st Underhill ward, Children's Hospital, August 21, 83. Suffering from old standing cough and swelling of the legs.

History. Last October patient had bronchitis following which kept her in bed for 6 months. Child sweats a great deal. Abdomen & legs much puffed. Urine scant. She has never been stout. No history of measles or Pertussis. Parents & 3 other children healthy.

On admission patient fairly well nourished and looks comparatively comfortable in bed. Cheek seems well formed. Right side more prominent than left. Abdomen distinctly distended, edematous. Especially the lower part which is pendulous. No ascites.

Notably there is considerable edema. Legs also edematous. Abdomen at level of umbilicus measures 24½ inches. After beat can't be felt or seen.
Examination of Chest. At lower border of sternum, chest measures 22 1/2 inches, at level of middle 20 1/2 inches. Right side 10 3/4, left side 10. The right side anteriorly appears the more prominent. Percussion anteriorly on right side more fairly resonant while on the left it is decidedly dull. Cardiac dulness merges with the pulmonary. Dulness is imperfect to level of nipple but below that it is absolutely dull. Auscultation anteriorly on right side normal on the left exaggerated breath sounds to level of nipple, below this they are feeble, distant & bronchial. Occasional friction sounds over half of the chest, most marked at level of nipple line. Percussion posteriorly on left side note all over is quite flat while on right it is about normal. On palpation the vocal fremitus can readily be made out, more distinctly left.
Assessment: Cardiac. Left side. The heart sounds appear to be almost entirely abolished. While on the right they are quite evident, leaving an inclination to be harsh in character. There is settling on pressure of dorsal aspect of chest. Patient coughs a good deal.

Circulatory System. Heart sounds normal. Deep Cardiac dulness begins 3/4 of an inch to the right of right sternal border. The dulness merging with the pulmonary dulness. Aperistaltic at uniform process of the sternal.

Urine contained a little albumen. It was difficult to make out any fluctuation in the abdomen, but there was dulness over both flanks. An enlarged spleen could be easily felt under edge of the ribs.

Signed Dr. W. P. Scammon. 7/12 
N.H. Scammon Co. 8/15
to be taken to get rid of disorder, also a mixture of acetate of pituit and solution of digitalis as a diuretic. Warm wet pack and milk diet.

August 26th. The hypodermic needle having been inserted the presence of pus ascertained. No chest was aspirated today and 6 oz of extremely fetid pus with some blood mixed drawn off. The trocar inserted below angle of left scapula.

Sept. 11th. Aspiration being of little avail. The chest was punctured today and about 5 oz of most horribly smelling pus extracted. The chest was afterwards washed out with a weak solution of boric acid. A large sized drainage tube inserted and the wound dressed with corrosive sublimate wool wadding. The incision
was made just below the inferior angle of left scapula. Chloroform was the anaesthetic used.

Sept. 14th: As discharge from chest still continues very feeble, the boric acid injection changed for a corrosive sublimate solution 1:3000.

Sept. 28th: Discharge from chest quite sweet now since the corrosive solution has been used. The drainage tube was cut short too soon with the result that a free exit of pus prevented. A longer piece of tube inserted today. Washing out of the chest stopped.

Sept. 30th: Temperature normal now. For the last 5 or 6 days it has gone up owing to nonescape of pus. The dulness has entirely much improved. Patient's general health good, is getting Cod liver oil.
and chemical food. No albumen in the urine.

Dec. 15th. Temperature 102. To day chest again washed out with Conoaric that chest still dull on percussion, on auscultation breathing not bronchial but is weak over all dull area. Chest expands to some extent & is about natural in size, neither contracted nor extended.

Nov. 6th. Patient has been going on well. Dressed daily, and discharge being but slight and not smelly. Last night at 8 P.M. the temp. rose to 101 but this morning it was again normal.

Nov. 17th. Patient up and going about the ward. Temperature has fluctuated between 97-2 & 98-4.

Last night 100-8. Since the 7th dressed every day and discharge decreasing.

Nov. 18th. Discharge still small, but
region of absolute dulness on left side occupying a considerable area round the opening. On introducing a probe into pleural cavity no fluid comes. In spite of this almost certain accumulation of fluid, the temperature not affected and today it is 98.4. Patient has rather more cough than usual.

Nov. 28th. Patient looks fat and well; Temp. 98. She is up every day now. There is still dulness in the place before mentioned. Getting Malattie at present.


Dec. 4th. Temp. yesterday 100. She was sick this morning, pulse 120, respiration 52. Kept in bed.

Dec. 5th. Yesterday at 5:30 p.m. Temp. 101.6. This morning 98.8. Pulse 132, respiration 48. Hydrominique needle inserted.
This morning, when it was found that pleural cavity still contains

in of left side. Patient looks very well indeed.

Dec 21st. Going about for some weeks apparently in the best of health.

Jan 2nd. Patient was dismissed today cured of Empyema. Weight 26 lbs. Chest measurement on left at level of middle is 9 inches on right 9 3/4 inches.
this morning, when it was found that pleural cavity still contains pus & serum. Former opening now quite closed.

Dec 6th. Temperature subnormal. P. 105. Respiration 32

Dec 15th. Since last puncture another has been made, but this time no pus detected. Apparently pus all absorbed. A good deal of falling in of left side. Patient looks very well indeed.


January 2nd. Patient was dismissed today cured of Empyema. Weight 126 lbs. Chest measurement at left at level of middle is 9 inches. at right 9 3/4 inches.
Case IV.

Janet Hogg, aet. 9, admitted to Dr. Andrews' ward, Children's Hospital 19th June 83. (Department of Medical Attendant).

History: Patient got a chill 18 days ago followed 2 days later by violent vomiting, after which she was seen by Doctor. Appearance then suggested pneumonia strongly. Face flushed.

Temp. 103.5. Resh. 50-60. Over right base laterally intense cutting pain aggravated by a short cough. No marked physical signs on percussion or auscultation.

7 days from commencement illness temperature fell to normal, and there was very little rusty sputum.

Since, the dulness of the R. Lung posteriorly has developed & within the past 3 days has progressed from below angle of scapula to its present limits & the temperature has shown a tendency to rise especially towards evening.
She had measles & pertussis when an infant. Otherwise always healthy. Father killed in an accident. Mother & rest of family healthy.

**Condition on admission.** She is a delicate, anaemic looking girl. Fair complexion. Fine skinned, fines nails clubbed and she has a tubercular look.

**Respiratory System.** Chest elongated & narrow. Marked flattening of chest as a whole. Left side expands more than right. Vocal fremitus absent on R. side axillary region & posterior on R. side. Percussion hyperresonant over L. side infraclavicular region - on L. side middle resonant. On R. side axillary region down to level of 6th rib the middle is of a hyper-resonant character below this it is absolutely dull. On left side breathing is vesicular.
In accompaniments. On the right side breathing bronches vesicular. Posteriorly there is caved with its convexity towards the left side. Distinct flattening of R. side & the vocal fremitus is absent. Right side dull from level of 5th dorsal spine downwards, this dulness extends into axilla, its upper border corresponding there to the 6th rib. On the right side in lower part the breathing is distant & tubular. In upper part it is vesicular & somewhat staccato. Left side, note resonant and breathing vesicular.

Cardiac & urinary systems normal.

On day of admission a hypodermic needle inserted partition on R. side and pus withdrawn.

Diagnosis: Empyema — was ordered M. Cap. Peni Phos 6s Peni. D: 2:2 34.
June 29th. To day Dr. Andrew aspirated the chest & drew off about 3 oz of pus.

June 30th. Patient much better. Temperature lower, hitherto it has varied much - from 98. in the morning up to 101-102 in the evening.

July 2nd. Since 5th July. Temperature has varied from 98. in the morning to 102 in the evening - chest filled up again - Dr. Andrew incised the chest on right side just below angle of Scapula and 6 oz of perfectly sweet pus evacuated - a large drainage tube inserted & wood wool dressing applied.

July 3rd. Patient has made an excellent recovery. Temperature has been normal since the operation and the Ulcers is much improved. Breathing not quite so
distant as previously. The wound was dressed daily and the tube was taken out on July 25. She has gained considerably in weight. She has been taking 1/2 gr. of the iodide of iron with 1/20 gr. twice daily since July 25. 1 grain of Natrium chlor id daily.

August 23. Up to present date there has been no return of the fluid in the chest. Note quite resonant posteriorly. The temperature has shown a tendency to rise in the evening, but she is still getting the Luminae.

October 4th. Patient was discharged today perfectly well, gained considerably in weight and examination of chest reveals no abnormality.
Case V

Michael MacFarlane aged 6.
Admitted to D. Underhill's ward in the Children's Hospital Sept 15-1933.

History. Illness began 2 weeks ago. set in with vomiting & fever, afterwards sweating at night. Loss of flesh. Has no definite complaint except general malaise.

Had measles & whooping cough 2 years previous.

Condition on admission. Face pale, no lividity but is an ill-nourished child. Has a slight cough.

There is no dyspnoea, breathing quiet, and looking quite comfortable in chest.

Respiratory system. Chest is well formed. Right side expands freely. While the left is nearly motionless.

Perception of left after reveals a hyperresonant almost tympanitic note. Tenderness begins at 4th rib on left side anteriorly and is absolute below this level.
Posteriorly there was complete dullness, dullness below middle of the Scapula. On Auscultation the breath sounds distant and feeble, but not bronchial over the dull area posteriorly. On Right side the percussion note was resonant, and on Auscultation the breath sounds normal but not exaggerated.

August 13th. The chest was aspirated today. The trocar entered just below the inferior angle of the Scapula. 53 cc of pus stained with blood drawn off.

August 14th. As a result of the aspiration patient has improved wonderfully, his general condition being good taking his food well. Temperature normal.

On Examination of the Chest the dullness has cleared up on the left side. The air entering
the lung freely - there has been no return of the fluid.

August 29th - Patient was sent to Convalescent home today.

Sept. 24th - Patient returned for further examination.
Both sides expand equally.
At left base there is if anything a slight impairment of the resonance. The Breathing sounds are audible to the very base and no accompaniments.

This has been a very successful case of Empyema Cured by a Single Aspiration.
Case VI.

Thomas Jamieson aged 6 years admitted February 5th 1855. 5 1/2 Underhill's ward.

Children's Hospital. Complaining of pain in the left side and of a short dry cough which has troubled him for a month or two.

History  Patient till lately enjoyed good health. He took ill about 11 days ago with a chill accompanied by vomiting which continued all night. He also complained of headache. Bowels were much constipated, not having moved from a week but, 2 days before admission they had freely moved after an apoplectic. Family history good.

Condition on admission. Patient is a delicate looking boy, fair complexion. Long eyelashes, is not well grown for his age. No signs of rickets.

He lies on his left side and complains of pain in his left chest and has a short hacking cough.
In inspection of the chest, it is found that there is considerable bulging of the left side and the intercostal spaces are obliterated. There is almost no movement of the left chest on respiration.

In percussion over the left lung there is sympathetic resonance for 2 inches below the clavicle. With this exception dulness is absolute over the whole lung. And on auscultation over the dull area the breathing is distant and tubular in character while in the infra clavicular region it is vesicular but exaggerated.

On the right side anteriorly the note is quite resonant and the breath sounds normal.

Posteriorly the left side is dull almost from the after rieft down to the base. The breath sounds are very distant and tubular in their nature. On the right
the pulse is regular and the breathing vesicular and somewhat
staggard.

- Circulatory System: Other heart
been to be pulsating under the
right nipple. and there is also
a diffuse pulsation in the felt

Tracheal cartilage - Heart sounds
normal. The Cardiac dulness
merges with the Pulmonary.

- Other Systems normal.

February 10th.: The chest was
aspirated today and Ty of
moderately thick fiins withdrawn.

February 18th.: Dullness absolute
over white lung. no change
in the position after anap hear beat.

February 19th.: It was intended to
aspirate the chest today but
it was found that there was
sympathetic rese was also on
axillary line.
February 21st. Symphatitic resorance extends to 1/2 an inch above nipple. There is then dulness for one inch below this. Over upper area of resorance breath sounds are heard but none over lower area. Posteriorly absolute dulness over whole lump.

February 24th. Symphatitic resorance can be heard down to 1/4 of an inch below spine of Scapula on the left side. Below this point it is quite dull.

March 15th. A free incision was made today on left side posteriorly in the 7th interspace and a large quantity of fluid evacuated. A drainage tube inserted. Chloroform was the anaesthetic used.

April 6th. Patient has made an uninterrupted recovery. Is looking well and has
furred ni weight. Temperature Normal. The drainage tube acted well and was discontinued after a week. To day the discharge is so trifling that the tube is to be discontinued, and patient allowed to get up.

A moderately resonant rattle can be heard all over the left lung, and the breath sounds can be distinctly heard accompanied at different points by friction sounds.

April 22nd. The patient was discharged to day cured.

The heart is still a little displaced but not much.
Emphysema means literally a collection of pus in the pleural cavity, which may either be general, filling up one or other side of the chest, or it may be localized, being bound down by adhesions.

It may occur at any age but is especially common in children.

Causes. It may arise as the result of some injury to the chest wall. I saw a lad lately who was suffering from a serous effusion in his chest as the result of a kick, and we can understand how readily this might have become purulent had the condition not been recognized.

The most common cause, however, is when an Emphysema is the outcome of a simple serous effusion which has
been set up in the course of some acute illness such as Scarlet fever or Acute Rheumatism, or as the result of exposure to cold & wet, or when the effusion has followed an attack of Pneumonia. An Empyema may arise as the result of the presence of a foreign body which has become impacted in a bronchus - or again it may arise as the result of an abscess connected with disease of the ribs or sternum, or from disease of the cervical or dorsal vertebrae.
Symptoms. The first thing that strikes one on looking at a child suffering from pneumonia is the pallor of the face which is not unlike that seen in Bright's disease. Dr. Enstice Smith lays great stress on this, he says "that the straw like colour of the countenance is extremely suggestive of the presence of pus in the chest." Unless there is a history of an acute illness at short time previous there is usually an indeterminacy about the symptoms. The child may lie quietly in bed, breathing easily, even although there may be a considerable quantity of pus present and with its heart displaced, and it may be able to lie on either side. As a result of the continued presence of pus a well marked
Lateral curvature is commonly met with, being found in Alex Leidlaw Case II and Janet Hoffs Case IV.

The temperature is generally raised somewhat, especially in the evening, but in chronic cases not unfrequently it may even be subnormal as in Annie Byrant Case III.

As the case goes on the child becomes gradually emaciated and affection variable. Complaint of pain in the side and this is usually a slight cough. Pulse quickened. Night sweats are common and diarrhoea is also of frequent occurrence in Empyema.

When the disease comes on after an acute illness such as Pneumonia then the symptoms are more marked.
The child looking miserable and ill, breathing quickly, temperature remaining high after the subsidence of the pneumatic attack, sweating at night. The dull area of the pneumoconia instead of clearing up becomes more marked than before. And then as the case progresses, this will be seen the bulging of the chest wall with diminished movement of the affected side.

There may be oedema of the legs and not infrequently a trace of albumen in the urine which however soon clears up.
Physical signs must be carefully gone into for they are much more perplexing than in the case of adults, for instance the vocal fremitus is such an uncertain quantity that the absence of it must not be too much insisted upon, for at least 8 times it is very variable in the child. And again, although we find in the adult absolute loss of the breath sounds on the affected side, we often get bronchial breathing all over the dull area. So that to come to a correct diagnosis of the presence of fluid in the chest the different physical signs along with the symptoms must be taken together.
By inspection much may be learned.

In a typical case we find that there is an impairment of movement on the affected side which is somewhat distended, and the intercostal spaces obliterated.

Oliver has pointed out that the affected side is more circular than normal — if the fluid be in great quantity then we shall find that the adjacent organs are displaced.

Tissue is often pushed downwards, and if the effusion be on the left side the afferent beat may be seen pulsating over to the right of the sternum, or it may be a right sided effusion when the afferent beat may be seen at a greater distance from the mid-sternal line than usual. In Dr. Eustace Smith's experience, displacement of the heart are quite as common in children as in adults.
Palpation of the chest is not of much use in helping us to a diagnosis in the child.

Percussion on the other hand is of the greatest moment.

There is complete dulness on the affected side, with increased sense of resistance. This dulness varies with the position of the patient unless of course the pus be circumscibed by adhesions. The percussion should be done very gently for on account of the resiliency of the chest wall the fluid is apt to be displaced, so that a resonant note is got when in reality the note should have been dull.

Another point to be attended to is to carefully examine the apex of the affected side. For what is known as Khoda's sympathetic note, this is a high pitched hyper
Resonant note and is often palpable unless one knows about it.

As fluid tends to fall to the most dependent parts, the dulness is commonly at the base and the alteration of the percussion note on change of position is a very valuable sign.

If percussion presents difficulties in the child much more so does auscultation. For while in the adult on the affected side the breath sounds are weak and distant and sometimes quite inaudible with an absence of vocal resonance, and although in some cases in children we yet the same signs, yet it is more common to find bronchial breathing all over the affected area; but which, if it is well to notice is almost always weaker and more distant than on the opposite side.
The auscultatory phenomena however vary so constantly, sometimes being
brought out at other vesicles
and are so puzzling that too
much reliance should not be
placed on them. This variation
in the breath sounds I found
very frequently in the cases in
the Children's Hospital.

Process of the Case. pus in the
chest is very slowly absorbed
and only if it be small in
quantity but, if be large in
amount and unless we remove
it several things may happen.

The pus may by its contained
presence in the pleural cavity
to irritate the lung substance
that it burrows it to branches
and this is reflected and
several cases are recorded in
which a cure has taken place
in this way.
Put a more common condition is when the pus externally in one or other of the interstices. The 5th interstice usually just below the middle is a common place for Empyema to burst. The contents of Empyema very much in their nature. The pus may be thick or slip, it may be thick and watery or may be mixed with blood. In an ordinary empyema, the pus is purulent but when there has been a communication with a bronchus or if it has burst externally then the discharge may be extremely frothy. In these cases of Empyema which burst externally after the first discharge of a large quantity of pus, the case tends to become chronic & may extend through a long course of years, discharging a variable quantity of pus through one or more sinuses.
In many cases cure of the disease takes place by a natural process. The pleural cavity becomes lined by a layer of granulation tissue and the contraction of the fibrous tissue thus formed draws together the walls of the cavity and tends to obliterate it. The chest wall falls in to its fullest extent the spine curves in, the apex becomes drawn in, the diaphragm rises and the heart with the right upper lung are to some extent drawn over to the affected side. The cavity is thus encroached on from every side and the formation of fibrous often completes the obliteration.

It will be easily understood how much more likely this cure will take place in children than in adults. In some cases however after a long course the end is unfavourable. The usual consequences of long continued suffocation supervene - Progressive emaciation, evening.
Rises of temperature, diarrhoea and night sweats indicate the presence of hectic fever. The liver, spleen, kidneys & bowel becomes affected with very disease and we get ascites and increasing albuminuria. These along with the continuous purulent discharge rapidly wear away the strength and hasten on the end.

Other dangers may also occur in the course of the case. The entrance of septic material in such a large cavity may set up irritative fever and even a general septicemia. At any stage of the disease tuberculosis may arise, the general condition of the patient predisposing to it.
Diagnosis. In coming to a diagnosis, we have to weigh thoroughly the various physical signs, such as the halo gained by inspection, the deficient expansion of the affected side, the bulging of the intercostal spaces, the past look of the patient and the marked dulness on percussion. But to decide whether the effusion be serous or purulent is often a matter of great difficulty. We must go into the history of the case, whether the illness has come on after an attack of fever, such as scarlatina or measles, or after a pneumonia, and attention should be paid to the general symptoms: night sweats, diarrhea, and the clubbing of the finger nails. Information is sometimes to be gained from the temperature, but too much reliance is not
to put on the air elevation of the temperature for we may get it raised in ordinary cases effusions and many purulent effusions have a subnormal range.

Dr. Wells says that local dulness with distant tubular breathing or absence of the breath sounds persisting after an inflammatory attack in the chest indicates the presence of a loca lesion.

The only way to settle definitely whether the fluid in the chest be serous or purulent is by inserting a hypodermic needle. This was done systematically in the cases in the Children's Hospital.
Prognosis. The presence of pus in the chest is a much more serious condition than when the fluid is simply serous, but although in the adult an Empyema is always a cause for much anxiety and the results of treatment not generally very satisfactory, it is otherwise in the case of children; several causes operating to such a result. The recuperative power is much greater in the child than in the adult, the tissues seem to have a greater power for absorbing not only serum but pus, as for instance in certain cases of Empyema being cured by absorption without any interference either by aspiration or incision. Another cause also is the fact that the chest walls are less rigid than in adults and the lungs
very ethereal.
The prognosis however depends on the extent of the effusion. Whether it be found a rest and also the length of time the pus has been in the chest.
Localized empyemas are more favourable than general ones.
Treatment. This is usually very successful, provided the child be not too much exhausted before it comes under our care. Having diagnosed the case to be one of Empyema by previously inserting the hypodermic needle and making out the character of the fluid. The question comes how shall we treat the case? Now there are several methods by which we can get rid of the presence of pus in the pleural cavity. First we may aspirate the chest, and this is well to do in all cases of Empyema before doing anything more radical. Dr. Bowditch has had good results from this method of treatment, so also has Dr. Barlow, and Goodhart.
had 5 successful cases by aspiration and one of mine, Case V (Michael Maclaren), after a single aspiration and when 50 lbs. were withdrawn—a very successful case resulted, the pus not being reproduced.

Aspiration is most successful when the empyema is localized and the pus is small in quantity in young children. Aspiration is indicated when the symptoms are very urgent. The operation is a simple one but there are several precautions to be taken. It is recommended that the patient be placed in a semirecumbent position.

The back should be thoroughly washed with some antiseptic solution and the site fixed for the insertion of the needle. Dr. Bowditch who is a great
authority, recommends that the needle should be inserted in the interspace just below the angle of the Scapula, unless of course the Empyema be localized.

A very convenient plan for preventing any pain on the introduction of the needle, and which I found very useful in many cases in the Hospital, was to freeze the skin with a mixture of ice and salt. This rendered the subsequent passing of the instrument absolutely painless.

Cocaine would also be very useful but I have not had recourse to it.

The Aspirating apparatus must be thoroughly clean, and it is well to see that it is acting properly before the needle is introduced into the chest.

The needle ought to be lubricated with Codliver oil.
An aspirator made by Bichat of Paris is the one I have seen most commonly used.

The N11 in aspirating we must be careful not to draw off the fluid too quickly nor should we endeavour to withdraw all the fluid at one aspiration.

On these two points all authorities agree. Fatal cases are recorded in which death has resulted from the aspiration being done too hurriedly, death occurring from asphyxia. Death has resulted from asphyxia for when the fluid is drawn off from the chest there is an afflux of blood to the capillaries not only of the affected compressed lung but, also, in those of the sound side with this leading to a sudden oedema which has not infrequently proved fatal.

Again a cerebral embolism may
occur due to a sudden disengagement of fibrinous clots which formed in the pulmonary veins of the affected side, the clots being liable to become detached as a consequence of the expansion of the lung. (Ludwig Smith) p. 188.

I have never seen any such decided results, but still I thought it right to mention them, to show that aspiration may not be such a trivial operation as some would suppose us to believe. Aspiration tends to prevent the collapse of the lung, and as I have before said, it is right that we should always give it a trial, but if after one or two aspirations we find the chest rapidly filling again, then it is useless to waste time. If the longer the illness has lasted the smaller is the chance of the lung
Understanding fully when we have ultimately to incise the chest, the long continued presence of pus destroying the elasticity of the lung. Having thus effected aspiration, I pass on to the second method of treatment viz. incision of the chest wall and the insertion of a drainage tube. This is a method of treatment which in children has yielded most satisfactory results.

By incising the chest we give free vent for the escape of pus, treating the pleural cavity on the same principles as we would an abscess.

If precautions were needed in simple aspiration not to withdraw the fluid too quickly for the reasons I have already stated, much more are they applicable and necessary to remember when
the chest is incised; for when the opening is made and if pus be present in any quantity it at once rushes out, thereby bringing about a great difference in the intra-thoracic pressure; and for these reasons Dr. Goodhart very wisely, I think, recommends a preliminary aspiration before the chest is incised.

Some authorities recommend that in addition to incising the intercostal space, a portion of a rib should be incised so as to facilitate free drainage and to permit of the fingers being introduced into the pleural cavity and thus the better able to make out its condition.

Mr. Richman Godlee, who has written much on the surgical treatment of empyema, advocates this procedure.
I have not seen this operation performed nor was it done in the cases under my charge in the Children's Hospital. It might perhaps have been useful in the case of Aper Bly and (Case III) who had such a protracted stay in hospital, and in whom it was necessary to wash out the pleural cavity on account of the nature of the discharge. By excising a portion of one of her ribs a larger opening would have been made, thus enabling the cannula connected with the douche to be easily passed. Perhaps in the case of Janet Hogg (Case IV) the ribs were so closely opposed to each other before the chest was incised that it seemed as if she would have been a suitable case for the excision of a portion
If a rib to allow of a larger drainage tube to be inserted—yet, when the incision was made and pus escaped it seemed quite surprising when we were able to introduce a tube of the largest calibre, the intercostal spaces seeming as a result of the escape of the pus quite distinct. I met with a similar condition in a case I saw lately in practice in Carlisle.

Details of the Operation.

The patient being put under an anaesthetic (Chloroform being the most suitable to use in cases of Emphysema as Ether is apt to set up excessive bronchial secretion from its irritating effect on the lungs which would not be a pleasant complication to have in the surgery of lungs).
The child should be turned over on its sound side - the clinician may...cleared & the arm raised but not at too high an angle as after it is depressed the opening may be valuable. The site usually
recommended for incision is the interface between the 7 & 8 ribs posteriory, but of course this entirely depends on the nature of the Empyema. The incision should be fairly made right down to the intercostal fascia, then a smaller opening made in the fascia which is enlarged by expanding a pair of dressing forceps inserted into it. When the chest is opened the pus rushes out and it is at this stage considerable care ought to be taken. The pus should be allowed to cope underneath a carbonized rag.
Placed over the wound.
Then a large rigid piece of drainage tube with a flange at the end to prevent it being lost in the chest is inserted into the wound which is then dressed with an antiseptic dressing. Some use Calendula pads; others absorbent wool. I think wood wool wadding is as good a dressing as any. The treatment should be carried out with full antiseptic precautions. The wound should be dressed twice the first day and at least once daily after that, depending however on the amount of discharge. The tube requires to be shortened in a few days but of course it depends also on the amount of discharge, so it is a mistake to keep the tube in the chest too long as by its
presence it is left to keep up suffuration.

The temperature chart indicates with remarkable precision the effect of the free drainage of fluid, the first effect being that the temperature falls and keeps down as long as the tube keeps patent. Should the temperature however then a tendency to rise then we may suspect that the tube is not acting properly and it will be necessary to insert a longer one.

It is usual at the first to introduce a good length of tubing about 4 inches long in the average.

In extremely infected empyemae it may be necessary to wash out the pleural cavity with some antiseptic solution.

Richard Godlee in his article in
Lancet" of January, 1886. mentions several cases of death as a result of the washing out of the chest, a comatose condition setting in shortly after the injection and ending fatally. Such conditions are said to be due to embolism by some, and by others as being the result of a reflex nerve action, but the matter is not definitely proved.

In Appleby's case, (case III) much benefit was derived from the injection of a weak solution of corrosive sublimate (1:2000).

But as a general rule the washing out of the pleural cavity in ordinary cases is not advisable—

In the operation for excision of a portion of a rib the incision is made as before, but at a higher level, and it is well to make
another cut vertical to the parallel one \( \frac{1}{2} \). The periosteum is raised and about \( \frac{1}{2} \) of rib removed. The continuity of the rib is now reestablished ("Godlee").

In addition to this operative treatment the general health of the patient is to be attended to by means of good food, tonics such as tin chloride, Codliver oil, Maltine, and the child should not be kept too long in bed for change of position by allowing the chest to expand freely, aids the expulsion of the contents of the pleural cavity.

In chronic cases of Empyema in which a fistulous opening exists and has discharged for a long time showing no indication of closing up an operation (Estlander's) has been devised by which portions of several ribs are
excised so as to facilitate the falling in of the chest wall. This method has not been very generally successful and I have not seen it performed in children. It will be rarely necessary if by the early recognition of the presence of pus in the pleural cavity we are prompt in our treatment for in simple incision or by the incision of a portion of a rib we have an operation which has yielded the very best results.

It is sometimes necessary to make a second opening after a time when it is found that pus continues to collect; this can readily be done by passing a probe from the first one up to the selected spot and cutting down upon it, and then passing a tube
through.

The other methods of treatment of Empyema by means of tapping with a Trocar & Canula, or by passing a tube through the Canula and draining by external action are so seldom used that I have simply mentioned them. They were not had recourse to in the Children's Hospital. In conclusion it seems to me that in few diseases of children do the results of treatment afford so much satisfaction as in Empyema and repay to such an extent the care and attention of the Medical Attendant.

In reading up this subject I have consulted the following works—

Ernst Ubbels, Text of Medicine of Emancipation of Medical Science, Holmes & Ubbels. System of Surgery.

and Godlee's articles in the Lancet. January 1886—