1857

Thesis

on the

Causes of Sudden Death

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Before proceeding to discuss the cause of sudden death, it is necessary that I should explain what deaths are to be considered sudden. For as almost every Physiologist who attempts to define life, differs in his definition from all others, there is of course considerable difficulty in defining clearly death and hence also sudden death.

In common language, death means the separation of the soul from the body, but as we are certainly ignorant of the exact time at which this takes place, we must look for some more physiological explanation of death than this. Dr. Symonds has divided death into two kinds, systemic and molecular, and these are thus defined by Dr. Carpenter. Systemic death is the cessation of the vital actions which occur between certain collections of particles constituting organs. Molecular death is the cessation of vital actions taking place between separate particles, but practically death is said to have taken place in some states of the body where the functions of some organs still remain and always long before general molecular death.
has occurred. The gastric juice is secreted in the recently dead animal and reflex action still rest in the nervous system of animals which cannot be said to belong. Morgagni has defined sudden death, as that which, forseen or not, takes away a man’s life suddenly without his expecta-
tion of the event, but this definition does not at all assist in explaining to what cases this term sudden is to be limited. The Reviewer sets of some investigations into the causes of sudden death in Helen, published by Ferrarino Romani in 1834, states that sudden death appears to comprehend a class of cases generally terminating in three days after the attack, but that can scarcely be termed sudden death. Dr. Blunt states that “Life is organization in action”, on this statement no practical definition of sudden death can be founded, and therefore giving up the attempt to define either death or sudden death, I shall merely state that in this dissertation I shall consider the causes of death 1st & those cases where it occurs instantaneously or almost so, while the individual is in sufficiently good health to be to all appearances normally
discharging the functions or duties of life and secondly (2nd) in those cases when although in which the individual does not instantly die, the functions of sensation or voluntary motion are suddenly arrested and general death follows after a short interval without their restoration.

This arrangement will I think include all the deaths which are generally called "sudden" as we cannot deny Bichat's definition however unsatisfactory it may be that "Life is the sum of the functions which exist within". if I think admissible to consider as sudden these latter cases when a fraction of this sum is suddenly destroyed death speedily follows.

Before proceeding to inquire into the diseases or other conditions which constitute the exciting causes it will be necessary to consider shortly the immediate causes of sudden death, or the mode in which death takes place, that will afford a groundwork for classifying as far as possible, the first cause of causes, according to the mode in which they terminate life.
Since Boerhaave first directed attention about fifty years ago, to the influence which the death or cessation of function of one organ exerts upon the other organs, and upon the general system, most writers on Pathology have devoted a portion of their works to the consideration of the Modes of Dying; and in no work is a better exhibition of this subject found than in Williams' Principles of Medicine, his classification however of the Modes of Death according as it begins at the Brain, Heart or Lungs cannot be perfect.

For the maintenance of life in the various organs or tissues of the body it is necessary that they should be continually supplied with a nutritive fluid; the assurance of the circulation therefore in the human body is followed by cessation of function in the various organs or systemic death, consequent upon the molecular death. The inquiry therefore into the Modes of Dying, resolves itself practically into the question, How is the circulation brought to a stand still? Secondly,
case the storgeage of the circulation "may be said to depend immmediatelly either on some change in the stricture or inner-
vation of the central circulatory organ or on changes in the circulating fluid; and severestions of the functions of the
ings, brain or other organs, nearly cause little by its affects on the circulatory
system. We may primarily think
all sudden deaths into two classes,
Hates by syncope & Hates by asphyxia
and one of these classes admit of subdivide
1st Hates by syncope, under this head
come the sudden Hates resulting from
changes in the structure of the heart,
by which its power of contractility or its
contractility is diminished, and suddenly
after having previously perhaps given
some indication of unprased action
its motion ceases altogether, it may
be on its being called upon to perform
some unusual exertion or without
any such uncontion fall; - The alteration
of the hearts action here is altogether
independent of the blood supplied to
it. Another, although this form of syncope
is not necessarily the result of a
failure in the supply of the nutrient
fluid to its walls by its proper
Innutent vessels. A change in the innervation of the heart can, according to most Physiologists, produce
sympathetic in two ways: in the first mode, Paralysis of the heart is the result, as in the cases of Section of the Heart
Substance; the second mode is where a Spasm of the heart is produced that organ remaining in a state of tonic con-
traction. As the heart's action has been proved to be independent, not only of the Splanchnic Nerves, but
also of the ganglionic system, and to depend on the sensory ganglia scattered through its own substance, it
might be supposed that these alterations in the innervation of the organ would also be inde-
dendent of these centres and depend on some primary change in the local system of Nerves; but though
it may be ultimately shown that some Sudden Death depend on such lesion; these conditions of Paralysis
and Spasm of the heart are more frequently attributable to a state of the Nerves of the heart induced in
some mode which we do not understand, but which we call by the terms utility,
with the other parts of the nervous system; the influence of the parasympathetic system seeming most frequently to cause spasm of the heart.

Alterations in the quantity of the circulating fluid may cause failure of the heart's action, that organ still possessing in full its power of contraction, but from want of a sufficient supply failing to put that power into action. Deficiency in the quantity of the blood is however the only mode in which the heart may be deprived of its proper tonus, as will be shown when considering the exciting causes of that mode of death.

Any mechanical obstacle resulting from disease, sufficiently powerful to stop the heart's action will of course produce death by syncope. Secondly, death by asphyxia. The arrest of the circulation in this class of deaths, depends almost entirely on change in the quality of the circulating fluid, by which it is rendered unable to pass through the Pulmonary capillaries; the cessation of the heart's function being like the death of the rest of the body, secondary to the stoppage of the
circulation, and the cause of the stoppage is in the former class of States. This change from the normal character of the blood depends on the absence of the chemical processes which should take place in the lungs, and the States from Asphyxia may be divided into 1st those resulting from Stricture which prevents the entrance of air into the lungs, by directly obstructing the air passages by causing the closure of the Pulmonary, by Mechanically preventing the dilatation of the lungs, or by changing their structure; all these are commonly spoken of as States from Asphyxia or Apnoea. 2nd. Those cases where the failure of the Respiration depends on, a perversion or destruction of the Nervous influence necessary for that function. Death in these cases is said to be the result of Apnea, where the failure depends on the destruction of the influence of the brain. Paralysis when the nervous influence of the Medulla is with drawn and of Convulsions, where the Nervous influence is preserved, and strength of the Respiratory muscles is the consequence.
These I think constitute the various modes in which sudden death may take place, or the immediate causes of death, whether the general systemic and even molecular death, may not in some instances be so sudden that they cannot be truly said to depend on the cessation of the circulation, but rather on the sudden destruction of all vital principle of the body, cannot be settled until the true nature of vital actions has been demonstrated by the complicated modes in which gradual natural death may occur, it does not fall within the province of this dissertation to treat.

In considering now the various pathological-real conditions on which sudden death may depend, I shall endeavor to classify them according to the mode in which they produce death, taking first those moral states which are likely to cause sudden or fatal syncope, or secondly those on which asphyxia depends, dividing them according to the subdivisions of their immediate causes of death. Sudden or fatal syncope, is a mode in which almost every cardiac disease is liable occasionally to terminate, but the perhaps most frequent known cause of
instantaneous death in the midst of apparent health is mortal painting resulting from that disease, the pathology of which has only recently been discovered by Rakitsky. Page 7.

Fatty degeneration of the muscular fibers of the heart itself, though not about the heart has long been considered a frequent cause of sudden death. Though it certainly is so; this affection of the heart of which is the faded life there is frequently no evidence even when the disease has been sufficiently advanced to be the apparent cause of sudden death, is probably the cause of a large portion of those numerous cases in which no reason to account for the death has been found. When we however we speak of fatty degeneration or other structural changes of the heart, as the cause of sudden death, it is evident we do not state the whole cause, for this morbid condition is not of sudden occurrence, but has existed for some time, and there must be some additional cause for the occurrence of instantaneous death. Here it is that in many cases we see this fatty degeneration considerably advanced, and yet life is destroyed by a process of gradual decay, the function...
of the heart and other organs ceasing gradually contemporaneously. In some cases the exact cause of the sudden death is evident enough as for example cases of rupture of the heart, when we can readily understand how the heart becoming very attenuated or fragile may be ruptured by the force of its own contraction; but in other cases when the heart being called upon to propel a larger amount of blood than ordinary, or to propel the ordinary quantity in opposition to some obstruction in the course of the circulation, is paralysed and no longer continues the effort of contraction; the reason of this paralysis is not so clear. In some cases we might suppose that the prolonged or continuous effort to propel the blood exhausts the force of the muscle, in the same manner as a healthy voluntary muscle may be fatigued by very unusual exertion; so in the condition of the heart we find its systole greatly prolonged; when the pulse is irregular or intermittent it is the long pause that causes the shot and remaining much the same as in health; its alternate contraction and dilatation which is characteristic of this muscle, may be essential to its retaining its power of
action; the prolonged and incompetent contraction may then, of itself, be sufficient to paralyse the muscle; but although this might explain some cases, there are certainly others which cannot be explained and which we must refer, I think, together with those cases where the heart is found rigidly contracted, to some unknown influence of this disease on the nerves of the heart. Of the latter cases Dr. Seirin says, "it appears as if the diseased fibres had permitted or excited an irregular action, a shiver in fact, of the heart." Mr. Akinatowky supposes that fatty degeneration often depended upon the heart having become hypertrophied, and then existing in consequence a loss of balance between the nervous and muscular power, which causes a kind of Paralysis; under this Paralysis the heart undergoes a similar degeneration to that of Paralysed Voluntary Muscles. Admitting the occurrence of this abnormal involuntary contraction of the heart, we would more readily suppose the cause of the sudden death to be some condition of the nerves, rather than of the muscular fibre. There are other cases of fatal syncope where the sudden cessation of the healthy heart's action, that organ remaining
often in this passive flaccid condition, or in the state of asymp., certainly depends on the nervous system, and this similarity of symptoms would lead us to seek the same cause of death, even though the heart was diseased.

Suddenly, fatty liver may prove accidentally fatal, not only by syncope in its limited form, but also not infrequently by arrest of the heart, and in some cases apparently by one. From the following analysis of cases given by J. Omerod & Drain, the frequency with which sudden death occurs as well as its mode of occurrence, will be evident. In an uncomplicated case of fatty degeneration, I think that it is the exception for the death to be gradual, in one case only of J. Omerod's, did the patient gradually sink, where no other lesion was found than fatty liver, and in that case it seems probable that the same unknown cause may have produced the sinking of the fatty degeneration of the muscle of the muscular fascia of the heart given by Drain. 25 or 26 died suddenly, and in 70 or the heat was prolonged; of these 26, 13 at least were death by syncope, seven deaths from rupture of the heart.
and one from cardiac dyspnoea. Of the thirteen cases where death occurred by apoplexy, in the other affections of the heart of any nature, were diseases of the coronary vessels, hypertrophy or dilatation; in one of these cases it is mentioned that the left ventricle was found firmly constricted. In the other case, there was found in one considerable aortic disease, the patient having suffered from Angina during life. In the second death took place during the inhalation of Chloroform, in the third there was tubular disease, symptoms of which existed during life. In two other cases the death is stated to be sudden, and was probably by syncope; there was in addition to the fatty degeneration in one of these a cyst in the heart containing a bloody serous-looking fluid. The other patient had been liable to attacks of Angina Pectoris, and died in one of them—there was some softening at the internal layer of the left ventricle of the heart. In the cases where death was gradual it might be referred to some complication, as Cancerous ones, Pears, Scirrhus or <, kept in one when there was rupture of the septum and death after some access; and one, where the patient died from exhaustion in an advanced stage of fatty disease.
In Dr. Faraday's twenty-five cases, including some of Dr. Page's, it only well sudden from fatty degeneration, one of them was sudden but there was advanced Valvular disease, these deaths all happened from apoplexy, in the other cases there was generally some complaint.

In all out of 59 cases, 32 died suddenly some without any previous symptoms of disease, others succumbing on the occurrence of a comparatively slight ailment.

I have already stated that fat about the heart or between the pericardial folds is a frequent cause of sudden death; these will not permit any account of cases, one interesting case however I mention, because here the disposition of the fat was such as to firmly embrace the Month of the large vessels, being deposited above the heart over the upper junction of the Pericardium, causing death apparently by Constricting the pulmonary artery, and causing death apparently by Constricting the pulmonary artery, and causing death apparently by Constricting the pulmonary artery, and causing death apparently by Constricting the pulmonary artery, and causing death apparently by Constricting the pulmonary artery. I have said that many cases of fatty disease terminate by rupture of the heart, and according to most authors this may prove a cause of sudden death, even when there is no disease of the Tephrum of the heart, though it is probable that if the Microscope had
been used in all these supposed cases, their number would have been greatly diminished.

The usual result of rupture of the Heart is distension of the Pericardium with blood and in consequence sudden death; for these consequences it is not necessary that the rupture should be completely through the heart. Mr. Abercrombie died from rupture of the Heart, the fluid extending only through some of the internal sinuses and opening a large vein, the center of the Article - from which I take the account of Mr. Abercrombie's death, think, that it and the case of a Lady occurring immediately afterwards are the only recorded examples of such partial rupture proving fatal; but similar cases are reported prior to those. Since then Mr. Andrews has reported a case in which sudden death was caused by rupture of some of the internal sinuses about the Membrane of Sower; I think however that here he was probably wrong in ascribing the sudden death to the rupture, it is more probable that a spasmotic contraction of the Heart had caused death and the rupture at the same time the state of contraction having passed off before the P.M. Inspection.
Repercussion of the heart is not necessarily sudden or fatal; if the rent is oblique so that the blood escapes very gradually, life may be prolonged for some hours after the first occurrence of the Pericardium, and in some cases where only a few fibres have been ruptured it is probable Anœmia may be produced.

And this leads me to Speak of Trauma of the Heart as a Cause of Sudden Death.

Speaking of this disease Dr. Cruickshank says: "Death therefore is not usually produced in this lesion by the tumour bursting most commonly the Patient dies after a long & protracted state of agony as in other diseases of the heart. In a few cases Death took place suddenly."

But I think we must arrive at a different conclusion after looking at Mr. Thurnam's report of the mode of death in 24 cases of Anœmia of the Heart. On 12 it was very sudden, in 3 it arose from syncope, in 7 from some unknown cause, the 6th ruptured into the Pericardium, in 6 into the Pleura in another, and in another death was caused by rupture of the substance of the Ventricles; this last case illust. dated the connection between this disease and syncope disease of the heart. The
Angina Pectoris usually terminates suddenly, but I think that there already in considering fatal heart and in alluding to other situated diseases, said all that is necessary about this train of symptoms as a cause of death.

Of the other lesions of the heart, dilatation without hypertrophy frequently ends suddenly, hypertrophy those fewer symptoms but is not as frequent a cause of sudden death by syncope, lesion of the pericardium is not so liable to cause sudden death as disease of the heart muscle, except when the disease starts of the left ventricle compass. These several conditions usually may be distinguished during life and are easily detected after death.

Pericarditis is apt to terminate suddenly both in the acute condition when the large quantity of effused fluid interferes with the heart action, and venous it susceptible of the same causes of sudden cessation as the fatty heart, and also when the disease has ceased leaving firm and general adhesion of the heart is very liable to fail on any extraordinary pressure on being centered even through there may have been no previous
Symptoms of disease of the heart.

Oligemia, the heart's contraction, and blood in the cavities cause sudden death. Dr. Price mentions the case of a boy who died quite suddenly when walking home from school, although he had been able to bear the excitement of being pressed upon. Not very long before, in the muscular substance of his heart was found a hydraline and a slight adhesion over the point of destruction.

In another case, the only lesion was hyper trophy of the columna carneae; in another case reported, where hypertrophy of the heart, there existed a string of lymph, extending from the columna carneae of the left auricle into the aorta orifice; it is hard to conceive how the lesion in this last case could cause death.

Sudden hemorrhages as bursting of aneurism will cause death suddenly, but not instantly suddenly; but often severe hemorrhages we have the heart in return affected by the loss of a large quantity, the quantity of blood supplied to the cavities lessened to that in any sudden erection or change in posture, instantaneous death may occur, the left cavity filling itself so as to perforce a large quantity of blood, and occurring but a small supply from the lungs, is paralyzed. All this...
is the sudden syncope in cases of extreme chlorosis, where however there have existed previously signs of great depression of the ganglionic nervous system and deficiency of the circulating fluid. According to the Chevrel who has written on disease of the coronary arteries, which he considers a very frequent cause of the sudden death of old people, the pathology of fatty degeneration of the heart at the time he wrote not being perfectly understood these vessels are very liable to undergo such considerable dilatation & disease in their walls as to burst into the pericardium and to cause death from the extravasated blood, putting a stop to the pulsations of the heart.

Ophthemia ischemica is a term applied by Mr. J. Chevrel to death produced as he believes by the inability of the arteries to return the blood to the heart.

He found this opinion in the O. M. appearance in their cases of his own, in two of which death was sudden in one it was from apoplexy. Having found the heart filled empty and the large vessels were in the same condition, he has two other cases in which the same decided appearances were found by Morgagni & Borello; and death took place by sudden sinking. With our
present notion as to the physiology of the
moving powers of the circulation, Mr. Young's
explanation is unsatisfactory, and although Mr.
Bliss gives the cause of sudden death, I think the latter
always endeavouring to find some other
explanation of these cases, and perhaps
Mr. Isaac is right in supposing them to
have been cases of paroxysmal de-pression of
the heart, as Mr. Paye calls it, which at
the time of Mr. Young's report was
still unknown, but supposing them to
have been so, may not the cause of the
sudden death have been such a want of
action in the vessels, as although it does
not prevent their returning the blood to the
heart, for this they never did, might render
them passive tubes, and thus give the heart
more to do, in propelling the blood through
them? Sudden shocks to the nervous
system, whether from powerful passions or
emotions, or from sudden injuries to the great
nervous centres, caused by the rapid extrac-
vasion of a large quantity of blood,
are not unfrequently the direct cause of
sudden death by syncope, even when no
preparatory disease of the heart has existed:
of the mode in which they cause syncope we
know little: some close to the mode in which
the passions and emotions affect the heart, in
perhaps to be gleaned from the fact, which seems
well established, that sometimes the emotions
cause actual accident of the heart. Inorganic
Poole and others who have written on
impulse of the heart, have considered, were he
innovation, passion and epilepsy. Struggles frequent
cause of this accident, and other writers have
recorded cases from great mental anguish.

Dr. T. Cook has written a book to prove that
the physical cause of the death of Christ
was rupture of the heart induced by
intense agony, and he brings forward
many instances to confirm this view.
In such cases there must have been that
sudden and without change in the capillary
vessels which in such cases by changing the
capacity of the circulation, induce the
spasmodic contraction or paralysis which
occurs. Dibert explains the effectual
of the heart—without difficulty, as he con-
tinued the heat of the emotions to be in the
vicera. Dr. Wilson further suggests that
in these cases we have a sudden exhaustion
of nervous power, and this may be the
true explanation of many cases, even when
there is spasm of the heart. For although this
does not appear likely to depend on emotion
serious power, the fact that in Animals treated to death, the heart is often found contracted, would seem to throw the possibility of this.

F. Marshall Hall's theory of the action of fasciculi, as he calls it, to which I shall allude at greater length, when speaking of the causes of sudden death, may assist in explaining the action of the emotions and emotions on the heart. In his paper on the Neck as a Medical Region, F. M. Hall, speaking of sympathetic fibres, says, 'If contracted state of the right side of the heart, especially such as would dilate the vessels, and indeed swelling of the neck, would I imagine arrest the coronary circulation and cause as it does, probably in too many instances the cause of sudden death.' In his authority I adduce this as a cause of fatal syncope although what the fascicule condition is, to which he alludes I cannot understand.

In a Paper on Hypertrophy & trophy of the Brain. F. Lins mentions a case of sudden death in which there was hypertrophy of the Brain & a flaccid heart. He would attribute death to the hypertrophied Brain & not to the flaccid heart, and he thinks that the former Brain was overlooked, probably in Withering's other similar cases. In another case of sudden death where there was a large heart...
and dilated right ventricle, and also hypertrophy of the brain, he ascribes the death to the state of the brain, and thinks that the hypertrophied heart, by keeping the brain in a state of constant hyposthenmic induced the hyposthenmy.

In certain general conclusions which he arrives at from the consideration of his cases, he states that "hyposthenmy of the brain is allied to or connected with apoplexy in degrees, either as a precursor, concomitant, or cause, that in that state, simply turgidous apoplexy may be more readily induced, or life may be destroyed by a very small clot of intracerebral blood. Though this remark bears more upon the second division of the causes of sudden death, yet taking it connection with the cases, it means to affirm that in that case a very small clot or a congested state would produce such a disturbed state of the nervous system as would at once stop the heart's action; another conclusion is that "It is probable that in cases of sudden death which on dissection have been attributed to a placid heart, angina pectoris, spasm of the heart, etc., hyposthenmy of the brain through unnoticed may have been the sole cause of death."

I think that it present that last conclusion, although it should be borne in mind,
is other formation, and that we should be 

danger, in such a case as the first he 

mentions in attributing death the flaccid pro-
ably fatty heart and not to the brain.

In Dr. Abercrombie's case it was evidently
the flaccid and ruptured heart that caused
the death; yet his Brain was one of the
heaviest ever known, weighing 6 3 oz.

Is it not improbable that if
death had occurred from the fatty heart
without rupture, would not Sir Ransome
have ascribed it on his principle to hypertrophy
of the brain?

Lastly among the causes of sudden death
by syncope, I come to one which is I think
next in interest to the first I mentioned
and which like that has been the subject
of Mr. Paytts investigations, more lately
Mr. Kidd has written an interesting paper
on the same subject— I allude to the
Coagulation of the Blood in the Pulmonary
Arteries. I place this among the causes
of death by syncope, adopting Mr. Paytts
view of the way in which this effect
proved fatal. A Coagulum slowly
forming in the Pulmonary Artery or its
large divisions, prevents to much blood as
usual passing with each pulsation of the
heart to the Lung, and accordingly the blood
is transmitted to the left side in greatly diminished quantity, but nevertheless fully arterialized, and as the left heart propels the blood to the system with proportioned slowness, no signs of disease are shown until some sudden call being made on the system for a larger amount of blood, the left ventricle empties itself capacity and completely, and not receiving a commensurate supply from the lungs, syncope takes place.

The causes of this coagulation of the blood are any obstructive disease of the lung causing the stagnation of the blood; weakening of the heart's power having the same effect; and this is particularly liable to cause coagulation of the blood if made more coagulable by previous hemorrhage, as frequently after Labour. St. John's has suggested that in some cases, clot from the uterine veins may be carried through the veins of Right side of the heart and becoming lodged in some of the smaller pulmonary vessels, may thus cause stagnation and consequently coagulation of the blood in the larger ones, thus perhaps some of the sudden deaths in Child-bed may be accounted
for: Other causes of the Conspicuation, we
bewhynng of the inner coats of the
Vilmorinon artery, and in cases where
none of these causes exist, Dr. Jones
attributed it to a morbid attraction
between the wall of the vessel and the
blood. T. Vichl gives the following
Analysis of the Mode of Death in 92
cases. The death was sudden in a
state of health, or apparent favourable
convalescence in 10 cases. It occurred
in 6 during serious illness but without
any symptoms to cause it to be foreseen,
in 12 its approach was gradual and
in 4 unreported. So that we have
her exactly half of the cases ending
in sudden death. This is a cause of
death only recently brought into re-

ter; and may account for many
of the cases, which have hitherto appeared
mysterious.

I now proceed to consider, as shortly
as possible, the causes of sudden death
by Tophyrum, dividing these causes
according as the mode of death is by
Tophyrum proper, comic, Paralysis or from
Tophyrum or Spinae, may be
caused by any obstruction in the air
Passages, preventing the admission of air into the lungs, this obstruction is apt to occur, first in all chronic disease of the larynx, which may have existed long without showing any symptoms. Dr. Barker writing upon this subject says, "all laryngeal cases, however chronic are apt to die suddenly." He gives a striking case where a young woman who had been in the hospital for a chronic sore throat and was dismissed as well, suddenly died, as a student was examining her throat before the last, on St. John's, and at that time the larynx was found extensively diseased. There is no disease of the larynx which may not terminate thus, the spasmodic closure of the Rima Glottidis being the cause of death. But there is one disease acute or chronic, Laryngitis Odematosa, which seems capable of causing very sudden death; even without the intervention of this nervous system. Dr. Porter describes this as an inflammation of the larynx producing acute infiltration of the submucous tissue, which, it appears, may take place very rapidly. He states that the disease is very insidious in its approach, and requires two cases of young men in apparent health, and was found...
dead of this complaint in the Morning.

A still more remarkable Case is that of

Mr. Francis, a tall powerful old Man of 67, in excellent health

with the exception of occasional dyspnea,

feeling suddenly indisposed on the Morning

of his death, obtained in Bed, and at

half past one, while suddenly talking

was suddenly attacked with dyspnea,

became speechless, motionless, with the

exception of one or two heaving attempts

at inspiration, and in two Minutes

and a half from the first seizure

was dead; the right Lung was

bound together with blood, the left into

less blood, was somewhat engorged,

the heart was hypertrophied but the

valves of structure were otherwise

healthy, the right cavities were loaded

with blood; the Epigastria was erect

and Aluminate, with straw colored

streaks from inflatuated Pur, at its

base; the same was the Appearance of

the Trunkal cartilages of folds

Whilst at the time there was no much

Odem, that the headage was completely

excluded, a strong fluid flowed out on

puncturing the Membrane or the

pericardic Closures of the Larynx.
Causes sudden death frequently when there is no local disease, the reason depending on some general constitution of the nervous system or some local affection of the larynx or on both of these as in Laryngismus Stridulus, a disease which is happily not always fatal, but which may and not infrequently does carry off an apparently healthy child, and which is perhaps the chief cause of sudden death in children. In Epilepsy where thissame may cause death it depends probably totally upon the general state of the nervous system. Lastly foreign bodies are apt to become impacted in the Larynx thus to cause sudden death, in most cases this cause of death is apparent from the history but thoseLaryngeal where the body which causes death passes into the Larynx during the effort of vomiting might be very puzzling and we shall have to recur to their occasional occurrence, as it may happen that the voice which chokes the Patient may have been the only one thought up. A very interesting case when the foreign body came from below a closed the Larynx in its course upwards, instead of meeting it at once in its course...
downwards, is reported by Mr. Edwards, an enlarged submaxillary gland was found projecting up through the Pina, and it was found to have entered the thorax from an ulceration at its upper surface, a little above the bifurcation, having been inoculated by the surrounding suppuration, with the exception of a few pieces of cellular tissue, which passed it at its upper part, perhaps had it not been for this adhesion, the gland might have been perfectly

The great analogy between the various modes in which death may be affected by the larger or by the heart, as I think, very striking; and what is known of the pathology of the former cases, may assist our conclusions as to that of the latter.

II Where no obstruction exists in the air passages, there may be such changes in the structure of the Lung, as prevent the normal chemical changes of the blood going on, or thus produce asphyxia; the following are the conditions of the Lung, which Dr. Leat, who has written on the subject, describes as causes of sudden death, &c.: Engorgement of the Lung.
Of which there are two forms, the one, congestion of the tissue without emphysema, the other, congestion with emphysema or a resemblance of the pulmonary tissue to that of the spleen. This lesion in some cases terminates gradually in others speedily. The first form of congestion is frequently produced quite suddenly from exposure to cold or sudden death follows; the congested lung no longer permitting the transmission of the blood through the capillaries, the right heart becomes loaded with blood the left chamber empties itself, and does not receive a fresh supply; or death is the consequence. Hypostasis of the heart is not infrequently found in this disease, and it is quite likely to be speedily fatal when from some pre-existing disease of the heart this organ is the readier to yield to the direct effects of asphyxia. It is not an uncommon cause of sudden death for of nineteen cases carefully recorded by Dr. Francis, four were from congestion of the lungs; the mode of death being clearly indicated by the state in which the heart and blood vessels were found; in one case pressure from
enlarged bronchial glands, in another instance probably from an enlarged Thymus may have assisted in causing the congestion.

12 of forty cases of sudden death in which the bodies were examined at the Morgue by Dr. Eversie, 12 were caused by Pulmonary congestion. And in 12 others there existed both Pulmonary and Central Congestion so that these lived in more than half the cases.

2d. "Pulmonary apoplexy or sudden sanguineous congestion, with rupture of the tissue of the lung, and sanguineous extravasation into its substance."

This disease is not necessarily sudden fatal but when the lesion is very circumscribed death may be quite instantaneous. Mr. Allen has narrated a case which illustrates well the circumstances under which that form of sudden death is likely to occur. A man previously in excellent health meeting his late landlord who had ejected him for arrears of rent brained on seeing him, and threatening him, fell death in his arms. The heart was hypertrophied, there was blood extravasated through about four-fifths of one lung of three-fourths
of the other. Mr. Olivier concludes that the
inflammation depended on that forced
almost convulsed state of the respir-
atory muscles which exists in an
effort to restrain any powerful excita-
tion; allowing this to have been
merely the cause, I would add also
an exaggerated contraction of the heart
such as we have seen may be produ-
ced by sudden emotions.
3rd." Inflammatory congestion of the
Lungs." Here, says Olivier, death
appears to strike the individual in
perfect health. It occurs suddenly,
and yet on opening the body we find
the lungs suffereing to a greater or
less extent." He states that this
form of sudden death occurs chiefly
among old people and on referring
to the Memoirs of M. M. Fourneau and
Hermantone, to which he refers us, I see
that it occurs especially among old
and feeble people, being the most
frequent cause of sudden death in
the aged women at the Bastille.
4th." Spontaneous emphyseme of the lungs
this is a cause of sudden death advanced
by Mr. Olivier, as likely to occur in
similar circumstances to those in which
Pulmonary Affection occurs; he formed the opinion on the case of a man in excellent health of an excitable and irritable disposition, who quarreled with a friend and would have fought but was restrained, he then walked home a distance of a about a hundred or fifty yards, making violent efforts to calm his passions dropped dead at his door step, on examination of his body the only morbid appearance was very general and great emphysema of both lungs, extending to the interlobular cellular tissue. This he supposed to have been produced from such a convulsive effort as I have mentioned before, and to have been the cause of death. He supposes this lesion to be that may have been overlooked in many cases of unexplained sudden death.

5th. "Nervous affections of the lungs." This form of death comes on usually in cases of asthma, hooping cough, and in accents of suffocation in pimply children. In these latter cases Stengel alludes to traumatical closure of the glottis which we have
already considered, that all the affections of the lung, which Dr. Lebert considers able to produce sudden death. In addition, however, to these, hydrothorax may be caused by fluids in the cavity of the chest, compressing the lung. Chronic chronic effusion effusion into the cavity of the chest is very liable to end suddenly in old people, who can put on very well with the amount of lung available in this disease, until some cause of excitement affects the circulation, and the heart’s action is stopped, as in the case of the congestion in the pulmonary arteries. This form of death is more correctly one by asphyxia than one by asphyxiation. The sudden entrance of any fluid into the cavity of the pleura is very apt to cause death, especially if the effort is increased, the opening of an abscess of the lung into the cavity of the pleura, or a wound of the thorax admitting air is such a cause. A fissure or of the lung vessels may burst into the pleura and fill it with blood, but here the death is usually from hemorrhage, and...
The same may be said of the mode of death, where in pulmonary effusion, rupture of the pleura takes place, and a large quantity of blood is forced out into the cavity of the pleura. Dr. Peterson of Linn has pointed out the possibility of such a form of pulmonary effusion, and has described nine cases, some of them from his own observations, others collected from various authors.

Lactose among the causes producing asphyxia proper, I must mention as a very interesting one. The presence of air in the blood itself, and by air I do not mean necessarily atmospheric air, I introduce it among the causes of death by asphyxia because I think that Mr. Eichsen has satisfactorily shown that the cause of death in these cases is the inability of the moving blood to feed the capillaries of the lungs, and not the paralysis of the heart, from distinction of its cavities with air as had been long supposed.

It is well known that the accidental entrance of air into the lungs during
Operations, is an occasional cause of sudden death, and it has been suggested that the admission of air by the open mouth of the patient, while after delivery may be one of the causes of sudden death, in childbirth. It is not, however, so generally known that sudden death may be caused by the spontaneous generation or development of gas within the circulation. That this is the case, however, as I think sufficiently proved by the records of three cases described by Mr. Oliver and of one described lately by Mr. Stewart. In the examination of one of these it is evident, I think, that every proper precaution was taken. The internal appearances are the same as those observed in cases where air has been introduced into the circulation; the right side of the heart contains air or muddy blood, the left side is empty. In two of Mr. Oliver’s cases, the patient, one a child, the other a young woman, was convalescent from fever; in the other the man was in perfect health. Mr. Tardel’s case was that of a lady who was attacked while in her bath, with a sense of depressiveness and pain, and died almost immediately.
b. M.

Reflex Heart
The true Death

W. R. G. Smith

Pp. This degeneration of the muscular substance of the heart is ascribed by Coninx 50 years ago as observed by several anatomists. He has a chapter

Dela degenerescenza graipsana ou
tofia musculaire du Coeur
Now proceed to consider the causes of
Asphyxia from Coma, Paralysis, &c., of the first.
I shall say but little, as I believe that under ordinary circumstances
Coma, or loss of natural voluntary motion
is not capable of producing sudden death
even in the more extended sense in which
I have applied the term sudden death.
Death by coma according to Dr. Williams, is
produced merely by the abstraction of
Certain voluntary deep inspirations, which
in the state of health we perform voluntarily
at short intervals, as our sensations
tell us they are required; if this is the
true explanation of the mode of death by
Coma, I think it is rarely by the
abstraction of these voluntary
movements. Causes death so quickly
that it may be considered sudden.
Coma often forms the first stage
of death which occurs by paralysis,
this being the usual mode in which
Asphyxia whether hemorrhagic, congeal-
tion of temples causes death, by
destroying the functions of the Medulla
Oblongata, and thus withdrawing the
necessary nervous influence from the
Muscles of Respiration.
Extravasation of blood into the brain may cause death very rapidly; and under different circumstances it may take long to kill, or patients may recover from it. If the quantity of blood thrown out is such that it exerts pressure upon the Medulla Oblonga, we can hardly understand how it may cause sudden death, but under certain circumstances it would appear that a large quantity of blood may be extravasated, and tend towards over the Spinal Cord without causing very sudden death; it is probable that in these cases the extravasation takes place slowly. Hieronimii describes a case in which a Boy was attacked about the Middle of May with sickness and convulsions. Between that time and the end of the month he continued to feel ill, had attacks of sickness and convulsions, became constipated for three or four days; and died on the third of June. There was extravasation of blood into all the Vessels and the Spinal Cord was enveloped in Coagulum. In other cases a very small clot has caused immediate death, as in a case where the clot
was in the Medulla Oblongata, leaving the jirirs across, written by M. Alphonse and another by the same author, where the clot was not large — was in the anterior lobe of the Cerebrum. Even extravasation into the Med. ploag. is not always immediately fatal as shown by cases reported by Alphonse, &c. Of 15 cases of Frenzious Affection in males reported by Dr. Boya, &c., at least were sudden; of the same number of fatal cases in females one only was sudden. In all, out of thirty deaths, seven were sudden. But in many cases, when the order of symptoms at time of death points to the condition of the Brain or within the Medulla as the cause of sudden hypostasis which takes away life, no lesion of the nervous Centre is found on C. M. Examin.

It is probable that in such cases there has existed sometimes the condition of hypostrophy of the Brain, upon which 5 tons lays so much stress, in other cases these have existed during such a congested state of the vessels as may account for sudden death. In many cases the vessels are found open. Death greatly congested the cause of sudden death having been simple
Janginous Apoplexy. It is in connection with these forms of sudden death, that Dr. Marshall Hall's views as to the cause of Apoplexy and other Seizures are interesting. He considers that in many cases, the change in the Circulation and the congestion of the vessels of the brain, depend upon a paralytic contraction of the muscles of the neck, owing to which there press upon the large veins the situation to prevent the motion of blood from the brain. This paralytic contraction of the muscles he calls Phlebitis, and the consequent condition of the veins, Phlebitis. He considers the muscles of the neck to be the muscles of the emotions, and hence their contraction of the muscles comes on sometimes when we are affected by any powerful emotion, causing Vertigo &c. He considers blushing to be caused by pressure of external Jugular vein by the Platysma muscles, and to each vein he allows its compressing muscle: Compression of the internal Jugular will produce Vertigo more exaggerated when combined with Compression of the other veins. Coma; Compression of the Vertebrals as well causes Convulsions & paralysis. When the muscles act in their normal...
Condition, then, expansion takes place externally, but if any compressing agent is placed round the neck, which prevents this swelling taking place externally, it still takes place and by the internal pressure the veins are compressed and the same paroxysmal seizures take place as from exochelismus. The chief point which marks these attacks are their paroxysmal character, but the first thing we can readily understand might be latent. Sir W. Hall states that typocal seizures may also be caused by the sudden change in the circulation of the medulla from the compression of the veins proceeding from it. "Exacerbated meningitis is advanced by Dr. Hall as a cause of sudden death;" he cites three cases where sudden death occurred after some slight complaints of uneasiness not referred particularly to the head, and when on P. M. Examination, a puriform exudation was found in the tentorium-achondral cell membrane, covering the greater part of the inferior surface of the cerebral lobes. Death by spasm is produced, occasionally in general convulsions from whatever cause they
...but these Maladies are fatal oftener by exhausting the system, or if suddenly, by producing intense congestion of the brain; this congestion being partly caused by the contraction of the muscles of the neck, or Practellmus or of T. Hall. The consequences which are most frequently fatal are those which depend on tumour, abscess, or other organic disease of the brain or are perpetual in their effects.

Having concluded how the Pathological conditions which constitute the exciting causes of death, I must consider shortly the predisposing influences of Sex, Age, temperament, habits and season.

First as to sex. I find that the Male is far more liable to sudden death than the Female. Notwithstanding the apparent influence of the corporeal influence, condition, in predisposing to sudden death. Thus in 1843-1845, 1.15 per cent. of the Male Deaths were sudden, of the female deaths 1.05 per cent.

Let us turn to the question of the influence of age on sudden death. I may state that while about an equal number five per cent. of the deaths of Men & Women are attributable to diseases of the circulatory system, the proportion of Men who die from diseases of the Nervous system 

greater than of the Women dying from the same class of diseases. The fact as to the known causes of death may give us a clue...
to the unknown. 2ndy. Though persons of every age are liable to sudden death, there are certain periods when this form of death is more frequent than at others. In the first year of life sudden death is very common; less frequent but still common in the second year; from this period to 15, sudden deaths are much less frequent; their proportion increases after this, and they are more common among females from 15 to 25 than among males. According to S. Granville about 1/8 of all sudden deaths occur between the age of 20 to 40; the number of sudden deaths, cause unknown, is largest between 40 to 50, between 60 to 70, after which the proportion is smaller, not only absolutely but relatively to the persons living at that age. 3rdly. as to temperament, its influence on sudden death is (popularly much overrated): it is quite clear after a consideration of the causes of sudden death, that other than short-necked, red-faced, temperate persons, are likely to die suddenly, but still that some of these causes are more likely to occur in one constitution than another cannot be denied. 4thly. habits of intemperance, strongly predispose to sudden death.
and those labouring under any warning symptoms, should be careful not only in their diet, but in their Regimen Moral & Physical.

5th. The effect of temperature or rather season is illustrated by the fact that the Winter months are far more fatal in this form of Death than the Summer months.

A knowledge of the causes of sudden death, is of the greatest importance: for it is a fact that cannot be denied, that the number of sudden deaths has been for some years still is increasing, in proportion to that of other deaths. In 1851, 8,897 in 1000 deaths were sudden; in 1852, 8,968 in 1000; in 1853, 9,701 in 1000.

To stop this increase in the number of sudden deaths we must look for the cause of the death.

The knowledge of the principal causes that I have considered, must be applied in our examination into the cause of death. Present at the death we must endeavour to ascertain the mode of dying, by observing the order in which the function ceased. And in our P. M. Examinations we must examine carefully the state of the heart, large vessels with the same object, and having ascertained the mode
of death, we must look curiously and carefully for
the cause of it; in that way says Dr. Cline
"by studying with scrupulous attention all
the orfals we shall see, the number of those
cases the cause of which is unaexplained.
After the instigation of the body, gradually
deceased."