upon as a necessary step, it should consist of at least two separate areas. One to be used by the sick, the other as a camp of detention, in which suspected or exposed cases may sojourn until the presence or absence of the disease can be determined, then their case can be dealt with accordingly.

In the case of large establishments or mines, it often becomes a very serious question in the minds of the authorities as to the wisest course to pursue. If the case has been recognized early and but few of the employes have been exposed, it is manifestly unjust to require the closing of the entire establishment. But, on the other hand, if precautions are not taken there may result a very serious outbreak of the disease. In these cases, if the co-operation of the managers can be obtained, a universal compulsory vaccination, and directions that foremen keep close watch upon all employes for any evidences of sickness, and that any employee who may not be well be returned home until entirely recovered, will generally prevent danger of a severe outbreak. But if, as unfortunately is sometimes the case, the management evinces an inclination to deceive the authorities, the whole institution should be uncompromisingly closed for a period of fifteen days. By that time any which were infected at the time will have developed.

In a mine, where the working population is of a floating class, a compulsory vaccination, with the issuing of individual certificates bearing the name and description of the holder, should be instituted and the foremen instructed to see that each man under his direction be provided with such certificate before being allowed to work. This will usually be sufficient, but we have found in some cases that it was further necessary to send inspectors occasionally through the plant to see that each individual had with him his certificate.

Again, as unscrupulous physicians have been encountered who have issued spurious certificates of vaccination over their own signatures, or who have wilfully made sterile scarifications to simulate vaccination, it may at times be wisest for the physician in charge to recognize or accept absolutely no certificate but his own or that of his assistants, thereby avoiding all personal discrimination, and, by revaccinating all doubtful cases, be positive of having discharged his duty to the best of his ability.

THE DIAGNOSIS OF MILD AND IRREGULAR SMALLPOX AS FOUND IN THE PRESENT OUTBREAK IN THE UNITED STATES.*

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In this paper I will mention and describe only the cases of smallpox which have come under my personal observation during the past two years. Previous to 1899 Chicago had been practically free from smallpox for more than a year, having had but one case in 1898. From March 9, 1899, to the present time—about 27 months—310 cases of smallpox have been found in Chicago. Sixty-four of these in various stages of the disease were imported into the city from nineteen of the surrounding states. The cases came from as far east as New York and as far west as California. In the

meantime, I visited three of the neighboring states where the diagnosis of this disease, variously called impetigo contagiosa, giant chicken-pox, Cuban itch, or some other indefinite name, was in dispute. With this opportunity of observing cases imported from such widespread and various sources, I think it is fair to assume that the disease we call smallpox in Chicago is the same disease which has been the subject of controversy in all parts of the United States.

On February 15, 1899, a colored man and wife, named Edmonson, arrived in Chicago from Cincinnati, sick with smallpox in a mild form. A physician was called, who promptly made a diagnosis of chicken-pox and treated them for that disease. Several cases of smallpox resulted from this mistake in diagnosis. This was the beginning of periodic importations of smallpox to Chicago from neighboring cities and states, which have continued up to the present time.

From the date of the discovery of this first case, March 9, 1899, to August 16, 1900—17 months—we had 72 cases of smallpox, 25 of which were direct importations. From this last date, August 16, 1900, to November 30, a period of three and a half months, we were entirely free from the disease. This marked the end of the first influx of the much-discussed disease. On November 30, 1900, Charles L., in the pustular stage of smallpox, came to Chicago from Ashland, Wis., over the C. & N.-W. Ry. He walked into the City Hall, mingled with the crowds in the halls and elevators, visited various departments of public service and finally came to the Department of Health, where he was safely cared for. The day before this man arrived the Health Department had issued a warning to the public to vaccinate and revaccinate, as smallpox was to be found in all of the surrounding states. This case from Ashland was the beginning of a succession of importations and exposures which during the last six months have given us 238 cases of smallpox, 39 of which came from without the city. These two outbreaks of smallpox, with but three months intervening, gave us an opportunity to study 310 cases in the Chicago Isolation Hospital. Numerous forms of the disease were found. The typical case was always present, but the greatest number were deviations from this type. These deviations represented such a variety of forms that almost every case had something peculiar to itself, but the following classifications which I have made will aid in giving an intelligent description of the various forms:

- 1 Hemorrhagic case, resulting in death.
- 13 Confluent, with 3 deaths.
- 24 Semi-confluent, with 2 deaths.
- 54 Severe discrete cases, with no deaths.
- 179 Mild discrete cases, with no deaths.
- 39 Modified form—cases in which there was evidence of a more or less successful vaccination, with no deaths.

In this outbreak I have seen no cases of smallpox without eruption. I am satisfied this form—variola sine eruptione—exists. In the epidemic in Chicago of 1894-5, I carefully observed and studied thirty cases of this form. The evidence was conclusive to me that such cases exist. All the cases I saw of this form were in adults with old vaccination marks.

I have seen no cases with the initial rash in this present outbreak, though one man stated he had a rash over the body the second day of the disease, which disappeared the following day.

* Read in Symposium on Smallpox, in the Section on Practice of Medicine, at the Fifty-second Annual Meeting of the American Medical Association, held at St. Paul, Minn., June 4-7, 1901.

The hemorrhagic case had no unusual features. It was not a typical case of purpura variolosa, as vesicles formed on the face and hands, though not elsewhere, before the hemorrhages took place. After severe prodromal symptoms with high fever for three and a half days, a diffuse redness with thickly studded spots that seemed to be slightly infiltrated appeared on the hands, wrists and face. As this change in the skin appeared, the temperature dropped to normal and the headache, backache and nausea had ceased. This attempt at a variolous eruption went no further except on the hands and face, where small, flat, imperfect, confluent vesicles could be discerned. The skin became dark-red or copper-colored with general diffused inflammatory swelling; petechial spots appeared in the skin, and hemorrhages from the mucous membranes became constant. Deep-seated hemorrhages under the skin could be seen, dark-blue and bulging, giving the appearance of a bullet buried beneath the integument. The man died on the sixth day of the disease.

The typical confluent form is well described in numerous books, but as it is necessary to keep in mind the typical case as a basis from which to study all cases deviating from this type, I will briefly mention the essential symptoms. All cases, no matter how mild, will, in a more or less modified, imperfect way, follow the symptoms and clinical course of the typical case.

The typical case has a chill or a chilly feeling—a child often has a convulsion—followed by fever, sometimes high and sometimes not severe, nausea, pain in epigastrium, backache, headache usually frontal, dizziness, sweating during the initial febrile stage; the eruption appears the evening of the third or the morning of the fourth day, and as this eruption appears, the fever and all painful and distressing symptoms subside. The patient at this stage, if not prevented, will get up and walk about. The eruption, which is macular for a few hours, becomes papular, has a thick covering within the skin, which gives it the appearance of small shot forced up from below the skin, bringing with it this tissue as a covering. It feels like shot beneath the skin, if you care to feel of it. As a matter of fact, the papillary layer of the skin is not a part of the covering, but is involved in the inflammatory process. For diagnostic purposes, I think the most valuable distinguishing feature about smallpox is the fact that the papule develops next to the *cutis vera* and by extension downward always involves the true skin. This eruption first appears on the most vascular parts—forehead, nose, lips, throat, hands, wrists and penis. These papules at once begin to form into vesicles, and generally in 36 hours they appear to the eye as small vesicles, usually but not always depressed in the center.

About the fifth day the vesicle, with its thick, tenacious covering unbroken, and all the time enlarging, begins to appear opaque. It is the color of a pearl and is entering the pustular stage. The face is swollen and the eyes partly closed. At this stage, or a day or two later, the secondary fever begins. The pustules, with their thick investment which resists natural decay and accidental pressure, continue to fill and grow till the 11th or 12th day, when they begin to dry and by the 18th day of the eruption the pustules will have dried and dropped off, leaving large pigmented spots, and if the inflammation has been severe enough to destroy the skin, pitting will occur.

Besides the 13 confluent cases, we had two that were abortive confluent, which were very interesting. The

cases had all the classical symptoms of smallpox up to the 6th day of the eruption in one case, and the 5th day in the other. Both were pustular, and secondary fever was present. They were very sick and in one case I predicted a fatal termination. At this stage of the disease the fever disappeared and the pustules which were undersize for the 5th and 6th days, stopped filling, rapidly dried and had scaled off in the next five or six days. These patients, who were in a serious condition on the 5th and 6th days, were walking about the ward three days later. When desquamation was completed, at the site of the pustules there was infiltrated, inflammatory thickening of the skin. These were aborted cases known as hornpox (*variola cornea*), but I have described them here because they were confluent and the subjects had never been vaccinated.

The semi-confluent form, 24 in number, followed closely the symptoms and course of the typical case and needs no separate description.

The severe discrete form numbered 54. These followed closely the symptoms and course of the typical case. Under this form I have classed several cases which have been designated by the various writers as *variola corymbosa*. These are cases having thickly studded patches or clusters of pustules resembling herpes zoster. These patches are usually more advanced in the course of development than the lesions on the other parts of the same subject. There is nothing puzzling about a case of this kind, and to avoid mistakes it is only necessary to know that such cases are occasionally to be seen. A severe irritation of the skin in a smallpox patient will produce a cluster of lesions the size of the surface so irritated. A mustard plaster will have a similar effect. In one case a confluent patch as large as a hand appeared on a man's leg above the knee as the result of friction of a shovel handle which the man was using while in the prodromal stage of smallpox. One patient had clusters of thickly-studded pustules following the intercostal nerves on both sides of the spinal column. It resembled a double herpes zoster. Two reputable physicians, both familiar with smallpox, pronounced this herpes zoster, but after observing the case for several days, changed their diagnosis and reported it to the health department. The man had all the clinical symptoms of smallpox, with a discrete, general eruption in addition to the clusters on the back.

The mild discrete form, 177 in number, presented a great variety of deviations from the typical case. It is astonishing that there should be 177 mild, discrete cases in unvaccinated subjects out of a total of 310 cases of smallpox. None of these had ever been vaccinated, yet the disease was so mild that nearly all of them would have been wandering about the city or attending to business if some one had not stopped them. In these mild cases numerous deceptive aspects are presented. In a majority of the cases the eruption will appear after two days of prodromal symptoms instead of the evening of the third or the morning of the fourth day, as is usual. In some instances there were violent prodromal symptoms, chills, high fever, headache, backache and profuse sweating, followed by so insignificantly few eruptions as to be misleading to a physician who is inexperienced in the diagnosis of smallpox and somewhat surprising to the experienced doctor. More often the prodromal symptoms are very irregular and insignificant, as well as the eruption. There was sometimes absence of headache, and frequently the backache was wanting. Nausea was a pretty constant symptom in all

mild cases. Except the fever, I think it was the most constant symptom. Close inquiry brought out the fact that there was always some fever. The presence of the chill or chilly feeling was frequently denied. The symptoms were so mild in most cases as not to stop the subject from his work. The patient always felt better as soon as the eruption appeared, no matter how mild the symptom. If he had stopped work for a couple of days because of indisposition, he would return to work in most instances when the eruption on the skin appeared. I have found men in this form of smallpox in the pustular stage of the disease, working in printing houses, packing houses and factories. They felt no inconvenience and were not aware of the nature and danger to others of the disease with which they were afflicted.

The secondary fever in these mild cases was rarely present. In the mild discrete form were found numerous abortive cases. In these cases most of the vesicles were conoid, though a few usually would show umbilication. There was frequently an appearance of a difference in the age of the vesicle, some twenty-four to forty-eight hours in advance of others. These cases resembled modified smallpox. In three or four days the vesicles became dried pustules, and in eight or ten days desquamation was complete. The form known as wartpox (*variola verrucosa*) was occasionally seen. In these cases no vesicle was formed. The lesions remained papular; they enlarge by inflammatory infiltration, gradually dry up and scale off irregularly and imperfectly.

One of the cases remained in the hospital sixty days before he was through scaling. Another form, known as hornpox (*variola cornea*), was more frequently seen than this form. In hornpox the vesicle forms, but before it becomes pustular the contents of the vesicle are rapidly absorbed; a scab forms and scaling begins as early as the sixth day and is completed before the tenth day, or a couple of days later, if it is a confluent case. Some of the imperfectly filled vesicles dry up and have the color and appearance of pustules, but if cut into the contents are found to be dried, hardened and horny. In these cases no secondary fever is present, except for a day or two in the confluent abortive cases. The inflammation is not severe enough to destroy the skin and leave marks. When the vesicles dry up and fall off there is left a red nodule slightly elevated above the surface of the skin. This is an inflammatory infiltration, which is absorbed in a couple of months, leaving no scar. In some of these very mild cases, part of the vesicles were quite superficial, resembling chickenpox in structure, but a careful examination always resulted in finding some deep-seated characteristic lesions with thick investment, which is the great distinguishing feature between chickenpox and smallpox.

The modified form, 39 in number, represents cases in which the subject has some evidence of a successful vaccination, though none of more recent date than sixteen years. These 39 cases were all that entered the hospital with any signs of vaccination.

Right here I wish to say that the term "varioid," meaning like smallpox, should no longer be used. The writers do not agree as to what to include under that name, some calling all mild cases of smallpox varioid, while others include in the term only such cases as are modified by vaccination. Frequently I have had to spend valuable time in explaining the identity of varioid and variola to people afflicted with the former, and

sometimes had considerable difficulty in inducing them to be sent to the Isolation Hospital, because their physician had told them the disease was varioid, but had failed to explain to them that the term means mild smallpox. Many have the impression that varioid is not smallpox, and think if they are taken to the Isolation Hospital while sick with the former disease they are liable to contract the latter. In other instances, people who were told they had varioid took no precautions to prevent the exposure of others, because they thought varioid less contagious than smallpox. The term is a useless one and confuses the laity. Smallpox is smallpox, mild or severe, and should be called by that name, or its equivalent, variola.

Under the modified form we had one confluent abortive case. This case was identically the same in every symptom and feature as the two abortive confluent cases described under the confluent form, and has been placed here only because he had an old, imperfect scar, said to be from vaccination. The scar was forty-five years old. Another irregular case was one of abnormal distribution. The man afflicted was 39 years old and said he was vaccinated when a child. The scar was imperfect and doubtful. The patient had the usual prodromal symptoms up to the third day, when the eruption made its appearance and the fever subsided. The eruption appeared confluent on the face and semi-confluent on the arms. No sign of any eruption appeared elsewhere on this patient. The case ran a typical course with secondary fever and recovered. I think both of the above cases were unmodified smallpox, but the presence of the old scar said to be from vaccination compels me to place them here as of the modified form. One subject, vaccinated thirty years previous, had the form of smallpox mentioned by the elder Flint as *variola varieloides*. Smallpox was present in this case, but there was also present on the first day of the eruption large, round, well-developed vesicles identical with those found in chickenpox. The vesicles disappeared in forty-eight hours and the smallpox ran a short course without secondary fever. I saw a similar case in the epidemic of 1894-95. Nearly all these modified cases ran their course and scaled off in from six to ten days without secondary fever. In this modified form we frequently found a condition which is generally recognized to be characteristic of chickenpox and not present in smallpox, viz., as many as three stages of development of the lesions side by side. A few papules, numerous vesicles, some pustules, and even scabs, are found at the same time. These cases run their course and desquamate in six to eight days. In all these mild cases there will be some prodromal symptoms, with cessation of fever when the eruption shows, and though many of the vesicles may be quite thinly covered, some of the lesions will be deep-seated, invading all the layers of the skin.

The vaccinal status of these 310 cases was as follows: Five had typical old scars. The most recently vaccinated was sixteen years previous to the attack. This was a patient 40 years old whose statement may be doubted. The date of vaccination of the others ranged from twenty to fifty years previous to the attack. Nine had fair old scars, twenty-five had old, imperfect, doubtful scars. Two hundred and seventy-one never had been successfully vaccinated. All patients were carefully examined by three experienced physicians for evidences of vaccination and the record here given can be relied upon as correct.

An absolute diagnosis of smallpox can not be made before the eruptive stage, except in the hemorrhagic form. In all these mild cases there was a general conformity to the history and course of the typical case of smallpox. There was always the prodromal symptom with the subsidence of fever when the eruption appeared. But we have to remember that chicken-pox is sometimes preceded by prodromal symptoms and that chicken-pox attacks adults and that the prodromal symptoms in smallpox are sometimes irregular and slight, so that we are compelled in some cases to make the diagnosis on the character of the eruption alone, as presented to the eye. The diagnosis can be made, for there is a difference in the appearance to the eye and the clinical course of the development of the skin lesion. The smallpox lesion has a deeper origin than chicken-pox. The papule rests on the cutis vera and by inflammatory extension this tissue is implicated. Not all of the lesions are so deep-seated, but I was always able to find some of the vesicles with thick, tenacious investment which keeps the vesicle and pustule intact longer than is the case in chicken-pox. Chicken-pox lesions have only the outer layer of the skin for a covering. This covering is fragile, easily broken and is broken from the first to the third day of its growth. The vesicles or pustules of chicken-pox, no matter how robust, will not resist accidental violence or natural decay more than four days, except on the hands and wrists of an adult negro, where the covering of the pustule is so thick as to resemble or merge into the life history of smallpox lesions. The external layer of skin in an adult negro is thick, and the eruption of varicella here looks and feels like the papule of variola, but an examination of the lesion on other parts of the body will aid in determining the nature of the disease. Measles is a popular disease, and the first day of the eruption is often mistaken for variola. Such a mistake should not be made. In measles the fever is highest on the day of the eruption, while in smallpox this is a time when the temperature drops to the normal usually.

In making a diagnosis of variola, remember there are some prodromal symptoms in the mildest cases, if you are successful in getting the truth out of the patient; that when the eruption appears the patient will always feel better, unless there is present some intercurrent disease, and that the fever will subside as the eruption appears. Look for the early appearance of the eruption on the vascular parts, on the face, in the throat, on the wrists and hands, on the foreskin and glans penis. If you find a papule on the ears it will help in the diagnosis. Do not depend too much on finding umbilications of the vesicles; you will be disappointed in the mild cases, as it is often absent.

Of the 310 cases treated in the Chicago Isolation Hospital, but six died. It is this low death-rate in this epidemic that has led the laity and the inexperienced physician to doubt the diagnosis. To convince the inexperienced, the typical case must be constantly in evidence.

Why there should be so few serious or fatal cases in this outbreak I do not know, and I am equally ignorant as to why the epidemic of scarlet fever prevalent at the same time in Chicago has been so mild. Our knowledge does not reach far enough to say why one epidemic is severe and another mild in any of the epidemic diseases. These mild forms of smallpox are always present in all epidemics of this disease and have been recognized and written about from the time of Rhazas down to the

present. In Chicago and elsewhere I have had no difficulty in making a diagnosis of smallpox. Occasionally chicken-pox was encountered, but I never met any disease not well known and described. The occasional occurrence of chicken-pox in adults always has been a source of confusion to medical men who are not in constant touch with variola and varicella and have not become perfectly familiar with the clinical aspects of the two diseases in all their forms. An unrecognized case of chicken-pox in an adult may account for some of the reported successful vaccinations in a subject recovering from smallpox. Dr. Rawlings, of the Isolation Hospital, vaccinated more than 100 who had recovered from the mildest form of this debatable disease, and in no instance did he get a successful result, though they had never been previously vaccinated. In Chicago we placed all patients with smallpox—hemorrhagic, confluent, and cases so mild that they would be at work if not prevented—in the same wards in the hospital. Of these, 271 never were vaccinated. None of these afflicted with the mild form of the disease contracted smallpox from the severe typical cases, of which variety we always had a few in the wards, making exposure prolonged and certain. If these mild cases in unvaccinated subjects had not been smallpox, with this prolonged exposure numerous cases of smallpox would have resulted. Another fact to be remembered is that these irregular mild cases have conveyed typical confluent smallpox to other members of the family. One of the wandering variety, singing in concerts in various towns, had her case diagnosed as chicken-pox by several physicians in two states, yet she conveyed the disease to four members of her family, one of whom died of confluent smallpox in its most hideous form. This mild form of the disease gives immunity from smallpox and will transmit typical, confluent, or hemorrhagic smallpox. Of this we have had abundant proof in Chicago. Further, the disease follows the rule of smallpox in attacking exclusively those not protected by vaccination.

THE DISTINGUISHING CHARACTERISTICS BETWEEN MILD DISCRETE SMALLPOX AND CHICKEN-POX.*

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There are probably no other diseases, surely no other contagious diseases, so commonly mistaken one for the other as is the case in smallpox and chicken-pox. The error is seldom made of calling chicken-pox anything else than what it is, while some physicians are loth to acknowledge smallpox by its right name. They prefer instead to call it pustular syphilis, acne, bromism, chicken-pox; they go out of their way, seemingly, for names like Cuban itch, Philippino rash, yaw, etc. It is quite remarkable how persistent we have been that smallpox must be something else. It would look as though the profession had fairly forgotten about the discrete form of this disease. Physicians, as well as laymen, may have pictured in their minds the repulsive confluent or hemorrhagic variety to the exclusion of the milder kind.

Discrete smallpox is sometimes so extremely light, that medical men who have formed their conceptions of the disease from descriptive lectures and pictures,

* Read in Symposium on Smallpox, in the Section on Practice of Medicine, at the Fifty-second Annual Meeting of the American Medical Association, held at St. Paul, Minn., June 4-7, 1901.