

Definitions and Descriptions of Bloodstains and Stain Patterns

Spatter Pattern or Individual Stain Description (Individual Stain Description is for the preponderance of the stains in the overall pattern):

Cast-Off Pattern:

Definition (taken from OSAC in Bloodstain Pattern Analysis):

A bloodstain pattern resulting from blood drops released from an object due to its motion.

Characteristics (Taken from *Bloodstain Pattern Analysis Third Edition With an Introduction to Crime Scene Reconstruction, Third Edition*):

Elliptical shape demarcations

A stain where the minor axis is narrower than the major axis.

Circular shape demarcations

A bloodstain where the major axis and minor axis are equal lengths.

Stain size is generally 1 – 5mm

The widths of the preponderance of the stains range from 1 – 5mm.

A series of related linear spatter stains

Individual droplets are ejected from the object over time; thus, the droplets are ejected at various points along its path (often referred to as a swing cast-off).

Bloodstains deposited in linear or curvi-linear orientation

Stains are deposited in lines, which may be curved, straight or a combination.

Consistent parallel directional angles in the stains to the overall pattern

As the droplets were ejected in the same direction (either a forward or backward swing), the directional angles of the individual stains are consistent as well and follow the general direction of the overall pattern.

Consistent change in impact angle

When examining the linear or curvi-linear distribution (cast-off) of the stains across the stain spatters, there will either be an increasing or decreasing impact angle. In a drip trail, the impact angle of the drips will be generally consistent across the pattern, unless the individual or object speeds up or slows down as it moves.

No evidence of flows in individual stains

There are no obvious flows within the pattern.

An evident interrelationship in the shape/impact angles

The aspect of “related” spatter is evident based on the location, shape and directional angle of the individual stains being considered (gradually increasing or decreasing across the pattern).

Drip Trail:

Definition (taken from OSAC in Bloodstain Pattern Analysis):

A bloodstain pattern resulting from the movement of a source of drip stains between two points.

Characteristics (Taken from *Bloodstain Pattern Analysis Third Edition With an Introduction to Crime Scene Reconstruction, Third Edition*):

Elliptical shape demarcations

A stain where the minor axis is narrower than the major axis.

Circular shape demarcations

A bloodstain where the major axis and minor axis are equal lengths.

Stain size is generally 3 – 25mm

The widths of the preponderance of the stains range from 3 – 25mm. Parent stains under 3mm are most likely some form of dynamic spatter (e.g., impact o, expectorate), and if the analyst encounters stains in excess of 25mm, they are less likely to be stains produced by drips, but rather created by a large mass of blood (e.g., ejected volumes such as arterial).

Stains are large in diameter

Large drip stains or a mass of blood striking a surface may result in large elliptical stains.

This stain pattern shows an in-line distribution of spatter stains

The nature of the directional angles will suggest stains deposited in a linear fashion.

The spatters show a consistent stain size range in the pattern, that is relative to any change in surface characteristics or decreasing volume available to produce the drip.

An evident interrelationship in the shape/impact angles

The aspect of “related” spatter is evident based on the location, shape and directional angle of the individual stains being considered (gradually increasing or decreasing across the pattern).

Stains appear to lead from one direction to another

When examining drip trails and flows, the bloodstains appear to lead from one area to another.

Impact Patterns:

Definition (taken from OSAC in Bloodstain Pattern Analysis):

A bloodstain pattern resulting from an object striking liquid blood.

Characteristics (Taken from *Bloodstain Pattern Analysis Third Edition With an Introduction to Crime Scene Reconstruction, Third Edition*):

Elliptical shape demarcations

A stain where the minor axis is narrower than the major axis.

Circular shape demarcations

A bloodstain where the major axis and minor axis are equal lengths.

Stain size is generally 1mm or smaller

The widths of the preponderance of the stains range from 1mm or smaller.

Stain size is generally 1 – 5mm

The widths of the preponderance of the stains range from 1 – 5mm.

Numerous spatters 0.1mm in diameter

The widths of many spatters in the stain are 0.1mm.

Varying size range of the parent stains, but generally consistent throughout the pattern

The more acute the angle of impact between the event and the target, the more evident and dramatic the radiating distribution will be. If the event directs spatter at a more perpendicular angle (e.g., 70° to 90°) to the target, this radiating distribution is more subtle and difficult to visualize.

An evident interrelationship in the shape/impact angles

The aspect of “related” spatter is evident based on the location, shape and directional angle of the individual stains being considered (gradually increasing or decreasing across the pattern).

Stain pattern shows radiating distribution

A mass of blood that has been broken up at a point / area source by some force (blunt force, gunshot, etc.) force the blood to be projected outward in a radiating pattern. The directional angles of the individual stains when considered together will show this radiating effect.

Spatters show progressive change in individual stain shape further out in pattern they are

Blood subjected to force will radiate outwardly from the blood source. As these stains progress outwardly from the blood source, there will be a change in the shape of the spatters. This shape change is generally from circular to elliptical as the pattern progresses away from the blood source.

Stain pattern shows no linear distribution

The related spatter is evident based on the location, shape and directional angle of the individual stains being considered. The nature of the directional angle will suggest stains deposited in a radiating fashion. When considering the location of the stains, the shape of the stains will show an interrelationship. Across the distribution of the stains in the pattern, the shape of the stains will change in a predictable fashion based on their different angle of impact.

Spatters do not have ringlets or vacuoles

Blood not in the airway will not be mixed with the air and will not form ringlets or vacuoles.

Expiratory Pattern:

Definition (taken from OSAC in Bloodstain Pattern Analysis):

A bloodstain pattern resulting from blood forced by airflow out of the nose, mouth, or a wound.

Characteristics (Taken from *Bloodstain Pattern Analysis Third Edition With an Introduction to Crime Scene Reconstruction, Third Edition*):

Elliptical shape demarcations

A stain where the minor axis is narrower than the major axis.

Circular shape demarcations

A bloodstain where the major axis and minor axis are equal lengths.

The spatters show a varying range of size in the individual spatter

Stains color is diluted

Blood in the mouth may be diluted by the saliva. When this blood is forcefully expelled from the mouth, the color may appear to be diluted, especially when comparing the normally red blood in other area within the scene.

The spatters show a radiating distribution

A mass of blood that has been broken up at a point / area source by some force (blunt force, gunshot, etc.) force the blood to be projected outward in a radiating pattern. The directional angles of the individual stains when considered together will show this radiating effect.

Stain contains bubble rings (vacuoles)

When blood enters the airway, air and blood often mix and small air bubbles are often ejected with the blood. When the bubble bursts, it will leave behind ringlets or vacuoles in the stains. These ringlets may appear in a few stains or many stains.

Presence of mucous strands

Connective strands between small spatter caused by saliva.

Presence of epithelial cells or other chemical properties supporting a Respiratory source (e.g., amylase).

Blood in the airway allows the blood to make contact with surfaces and chemicals it would otherwise not have contact with.

Projected Pattern (Spurt):

Definition (taken from OSAC in Bloodstain Pattern Analysis):

A bloodstain pattern resulting from the ejection of blood under hydraulic pressure, typically from a breach in the circulatory system.

Characteristics (Taken from *Bloodstain Pattern Analysis Third Edition With an Introduction to Crime Scene Reconstruction, Third Edition*):

Large Elliptical shape demarcations

A stain where the minor axis is narrower than the major axis.

Stain size is generally 1 – 5mm

The widths of the preponderance of the stains range from 1 – 5mm.

Linear orientation

The nature of the directional angles will suggest stains deposited in a linear fashion

An evident interrelationship in the shape/impact angles

The aspect of “related” spatter is evident based on the location, shape and directional angle of the individual stains being considered (gradually increasing or decreasing across the pattern).

There is a large volume evident in the individual stains

When these large volume masses strike a surface, it is not uncommon to see flows out of the individual stains

Flows present in stain pattern

A flow will have clearly demarcated margins that lead from one point to another. A flow may be wide, narrow, straight or wavy. A flow may also move across a surface freely or follow a surface irregularity such as along tile grout lines.

Stain pattern shows lines of overlapping stains deposited in “V”, arc or serpentine

Arcs and serpentine patterns are the result of the rise and fall of pressure in the liquid stream causing different droplets in the stream of blood to be ejected with different velocity and possibly in a rhythmic fashion.

Non-Spatter Pattern or Individual Stain Description (Individual Stain Description is for the preponderance of the stains in the overall pattern):

Drip Stain:

Definition (taken from OSAC in Bloodstain Pattern Analysis):

A bloodstain resulting from a falling drop that formed due to gravity.

Characteristics (Taken from *Bloodstain Pattern Analysis Third Edition With an Introduction to Crime Scene Reconstruction, Third Edition*):

Elliptical shape demarcations

A stain where the minor axis is narrower than the major axis.

Circular shape demarcations

A bloodstain where the major axis and minor axis are equal lengths.

Stain size is generally 3 – 25mm

The widths of the preponderance of the stains range from 3 – 25mm. Parent stains under 3mm are most likely some form of dynamic spatter (e.g., impact or expectorate), and if the analyst encounters stains in excess of 25mm, they are less likely to be stains produced by drips, but rather created by a large mass of blood (e.g., ejected volumes such as arterial).

Stains are large in diameter

Large drip stains or a mass of blood striking a surface may result in large elliptical stains.

Stains show a random orientation on the surface

These stains are deposited in a random orientation and is distinguished differently than a drip trail.

Stain pattern shows no linear distribution.

These stains are not a drip trail but are randomly deposited onto a target surface.

One or more spatter stains

These stains may be several stains or a single stain.

Drip Pattern:

Definition (taken from OSAC in Bloodstain Pattern Analysis):

A bloodstain pattern resulting from a liquid that dripped into another liquid, at least one of which was blood.

Characteristics (Taken from *Bloodstain Pattern Analysis Third Edition With an Introduction to Crime Scene Reconstruction, Third Edition*):

There is a pooling of blood or some combination of blood and liquid exhibiting overlapping drips or spines

A blood into blood pattern is produced when drops fall into another stain and a volume accumulates on the target. The impact of the drop into the liquid on the target results in a significant increase of secondary spatter. The boundary becomes irregular as a function of drips falling and overlapping each other, as well as spines ejecting from the pool.

Stains show a random distribution of satellite spatter on surface

When blood drips into blood or another liquid, the second liquid is in a constant state of motion, either oscillation or rolling. When another blood droplet falls into this liquid already in motion, the satellite spatter is randomly distributed.

Satellite spatter present

This is bloodstains with evident satellite spatters present. The parent stains will generally be larger stains. The satellite spatter will often have tails that are either connected to the parent stains tails or the tail of the satellite spatter point back in the direction of the parent stain. Keep in mind that the satellite spatter produced by these patterns might be dissociated from the primary stains.

Primary stains do not have the evident elliptical or circular shape

These are not present in the primary stain, however may be present in other areas of the overall pattern.

There is a volume accumulation with irregular margins

The interaction of the large volume with the surface produces the irregular aspect.

Large irregular stains with spines

The interaction of the large volume with the surface produces numerous spines and radiating secondary spatter.

Flow:

Definition (taken from OSAC in Bloodstain Pattern Analysis):

A **bloodstain** resulting from the movement of a volume of blood on a surface due to gravity or movement of the **target**.

Characteristics (Taken from *Bloodstain Pattern Analysis Third Edition With an Introduction to Crime Scene Reconstruction, Third Edition*):

There is clearly demarcated non-spatter stain

Flows can form in a variety of fashions and on any number of surfaces; thus, their specific shape is a function of where they form.

Generally, have regular margins demonstrating movement along surface contours

Flows can form in a variety of fashions and on any number of surfaces; thus, their specific shape is a function of where they form.

Stain margins lead from one point on a surface to another.

Flows can move across a surface freely or follow surface irregularities (e.g., along tile grout lines).

Volume accumulation of blood

There is a large volume associated with a flow pattern.

The primary stains do not have the evident elliptical or circular shape.

These are not present in the primary stain, however may be present in other areas of the overall pattern.

Pool:

Definition (taken from OSAC in Bloodstain Pattern Analysis):

A **bloodstain** resulting from an accumulation of liquid blood on a surface.

Characteristics (Taken from *Bloodstain Pattern Analysis Third Edition With an Introduction to Crime Scene Reconstruction, Third Edition*):

This is a clearly demarcate non-spatter stain with regular margins

Pools can form in a variety of fashions and on any number of surfaces; thus, their specific shape is a function of where they form.

Volume accumulation of blood

When a large volume of blood strikes a surface, especially a vertical surface, there will be evidence flows in the pattern. A pattern where the primary bloodstain is larger than approximately 25mm wide may be considered a volume accumulation of blood.

Stain pattern does not have specific shape, rather it conforms to surface contours

Blood pools do not conform to a specific shape like a spatter stain will. The pool will conform to the container shape and/or surface contours.

Serum separation may be present

A large volume of blood will begin the clotting process. As the solids within the blood begin to separate or clot from the serum, there may be evidence of a clear liquid and a gelatinous mass.

Clotting may be present

The gelatinous mass formed by the collection of blood cells in fibrin.

There is no movement with surface contours

A pool of blood will show no movement while flows do show movement along the surface contours.

The primary stains do not have the evident elliptical or circular shape

These are not present in the primary stain, however may be present in other areas of the overall pattern.

Saturation Stain:

Definition (taken from OSAC in Bloodstain Pattern Analysis):

A **bloodstain** resulting from the accumulation of liquid blood in an absorbent material.

Characteristics (Taken from *Bloodstain Pattern Analysis Third Edition With an Introduction to Crime Scene Reconstruction, Third Edition*):

There is a clearly demarcated non-spatter stain

Saturation stains occur as a function of blood accumulating on a permeable surface.

The stain will not have specific shape but will conform to the surface contours.

Instead of forming a pool, the liquid blood is drawn into the surface.

The blood will absorb or wick into a permeable surface.

In some instances, rather than absorbing downward with gravity, the liquid can be wicked upward into the target. Wicking can occur due to gravity as well. The blood is absorbed or drawn into the material rather than pooling.

The primary stains do not have the evident elliptical or circular shape

These are not present in the primary stain, however may be present in other areas of the overall pattern.

Splash Pattern (includes a Gush):

Definition (taken from OSAC in Bloodstain Pattern Analysis):

A **bloodstain pattern** created from a large volume of liquid blood falling onto a surface.

Characteristics (Taken from *Bloodstain Pattern Analysis Third Edition With an Introduction to Crime Scene Reconstruction, Third Edition*):

Primary stains do not have the evident elliptical or circular shape

These are not present in the primary stain, however may be present in other areas of the overall pattern

There is a large volume in overall pattern

A spurt is a discrete pattern created by a distinct stream of blood, the gush is a very large volume ejection pattern.

Flows present from individual stains

A flow will have clearly demarcated margins that lead from one point to another. A flow may be wide, narrow, straight or wavy. A flow may also move across a surface freely or follow a surface irregularity such as along tile grout lines.

Volume accumulation of blood

When these large volume masses strike a surface, it is not uncommon to see flows out of the individual stains

Large irregular stains with spines and spatter radiating from it

When a large mass (rather than a stream) of blood is ejected under pressure and strikes a surface the resulting mass of blood can produce large primary stains with numerous satellite like spatters and spine-like stains. Because this mass is unstable throughout its flight, it may produce large irregular stains. This is generally the result of projected / splashed blood such as an arterial gush.

Large elliptical spatter stains that radiate out from the pattern.

The large mass is unstable in flight and is acted on by air resistance and gravity, which often results in smaller unstable masses of blood that separate from the primary volume before impact. These smaller masses will produce larger elliptical stains around the periphery of the primary pattern

Stain pattern shows lines of overlapping stains deposited in “V”, arc or serpentine

Arcs and serpentine patterns are the result of the rise and fall of pressure in the liquid stream causing different droplets in the stream of blood to be ejected with different velocity and possibly in a rhythmic fashion.

Swipe:

Definition (taken from OSAC in Bloodstain Pattern Analysis):

A bloodstain resulting from the transfer of blood from a blood-bearing surface onto another surface, with characteristics that indicate relative motion between the two surfaces.

Characteristics (Taken from *Bloodstain Pattern Analysis Third Edition With an Introduction to Crime Scene Reconstruction, Third Edition*):

Irregular shaped contact stain demonstrating a contagious boundary

The smear entails a contact with an irregular shape, where there is evident motion between the objects in contact with one another.

Pattern boundary shows feathering

An area of the stain pattern that shows a thinning of the blood volume. Within the pattern may also be trailers leading away from the main stain. These linear trailers result from the bloody object losing contact with the target surface.

Pattern shows striations in body of stain

There are evident striations visible across the pattern. These striations are often present due to lateral movement in the pattern and are generally smears, wipes and/or swipes.

Pattern shows diminished volume of blood across the body of the stains

As a bloodied object moves across a surface or an object moves through a bloodied surface, the blood is displaced in a lateral motion. The blood volume thins as it is spread across the surface.

There is evidence of displacement of blood

This is similar to the feathering of a pattern. Lateral movement through a bloodstain or movement of a bloodied object across a surface will deposit and/or move or displace blood across the surface.

Pattern shows no spatter or spines

The overall pattern shows no spatter or spines

The primary stains do not have the evident elliptical or circular shape

These are not present in the primary stain, however may be present in other areas of the overall pattern

The pattern may show no recognizable pattern

Due to the movement of the objects, the pattern may not be recognizable. The pattern may show a recognizable pattern.

There may be an accumulation of blood on the other boundaries

The smear entails a contact with an irregular shape, where there is evident motion between the objects in contact with one another.

Pattern has contiguous boundary on one side of stain

The pattern has a contiguous boundary on one side of the pattern.

There is no preexisting stain associated with this pattern

There is no evidence of a preexisting stain on the surface.

Transfer Stain:

Definition (taken from OSAC in Bloodstain Pattern Analysis):

A bloodstain resulting from contact between a blood-bearing surface and another surface.

Characteristics (Taken from *Bloodstain Pattern Analysis Third Edition With an Introduction to Crime Scene Reconstruction, Third Edition*):

Stain pattern has regular margins

Are clearly demarcated and lacks spines or protuberances.

A contact pattern

A stain pattern that contains little to no movement within the overall pattern.

Pattern shows angular demarcation, curves, or other recognizable characteristics

The stains are the results of bloodied objects transferring recognizable characteristics onto a surface. The shape of a knife, the

fabric pattern, a footwear impression, a knife blade are all examples of this type of pattern.

Stains appear to be deposited in a series

Repetitive pattern transfers are a series of similar pattern transfers, deposited over time on a surface or surfaces.

The primary stains do not have the evident elliptical or circular shape

These are not present in the primary stain, however may be present in other areas of the overall pattern.

Repetitive demarcations across the pattern

The surface of some objects contains a repetitive pattern, such as clothing weave, latex or nitrile gloves may be deposited within the pattern when these types of bloodstained surfaces make contact with a target surface.

Stain pattern indicates no movement

The pattern may contain characteristics described in the smear stain.

Void:

Definition (taken from OSAC in Bloodstain Pattern Analysis):

An absence of blood in an otherwise continuous bloodstain or bloodstain pattern.

Characteristics (Taken from *Bloodstain Pattern Analysis Third Edition With an Introduction to Crime Scene Reconstruction, Third Edition*):

Examine the pattern, there is a distinction between a pattern stopping and then picking back up and a pattern simply ending

Wipe:

Definition (taken from OSAC in Bloodstain Pattern Analysis):

An altered stain resulting from an object moving through a preexisting wet bloodstain.

Characteristics (Taken from *Bloodstain Pattern Analysis Third Edition With an Introduction to Crime Scene Reconstruction, Third Edition*):

Irregular shaped contact stain demonstrating a contagious boundary

The smear entails a contact with an irregular shape, where there is evident motion between the objects in contact with one another.

Pattern boundary shows feathering

An area of the stain pattern that shows a thinning of the blood volume. Within the pattern may also be trailers leading away from the main stain. These linear trailers result from the bloody object losing contact with the target surface.

Pattern shows striations in body of stain

There are evident striations visible across the pattern. These striations are often present due to lateral movement in the pattern and are generally smears, wipes and/or swipes.

Pattern shows diminished volume of blood across the body of the stains

As a bloodied object moves across a surface or an object moves through a bloodied surface, the blood is displaced in a lateral motion. The blood volume thins as it is spread across the surface.

There is evidence of displacement of blood

This is similar to the feathering of a pattern. Lateral movement through a bloodstain or movement of a bloodied object across a surface will deposit and/or move or displace blood across the surface.

Pattern shows no spatter or spines

The overall pattern shows no spatter or spines

The primary stains do not have the evident elliptical or circular shape

These are not present in the primary stain, however may be present in other areas of the overall pattern

The pattern may show no recognizable pattern

Due to the movement of the objects, the pattern may not be recognizable. The pattern may show a recognizable pattern.

There may be an accumulation of blood on the other boundaries

The smear entails a contact with an irregular shape, where there is evident motion between the objects in contact with one another.

There is a preexisting stain associated with this pattern

This may be a pool, spatter, a flow, etc. that is evident that the original stain existed.

Pattern shows displacement of blood from the original boundary

This is similar to the feathering of a pattern. Lateral movement through a bloodstain or movement of a bloodied object across a surface will deposit and/or move or displace blood across the surface.

Altered stain present (Skeletonization)

When blood deposited on a surface begins to dry, it dries from the outside in. When the bloodstain is disturbed after it begins to dry, there may be evidence of the outer ring of the original stain.

Additional Definition (taken from OSAC in Bloodstain Pattern Analysis):

Accompanying Drop

A small blood drop produced as a by-product of drop formation.

Altered stain

A bloodstain with characteristics that indicate a physical change has occurred.

Angle of Impact

The angle (alpha), relative to the plane of a target, at which a blood drop strikes the target.

Area of Convergence

The space in two dimensions to which the directionalities of spatter stains can be retraced to determine the location of the spatter producing event.

Area of Origin

The space in three dimensions to which the trajectories of spatter can be utilized to determine the location of the spatter producing event.

Backspatter pattern

A bloodstain pattern resulting from blood drops which can be produced when a projectile creates an entrance wound.

Blood Clot

A gelatinous mass formed by a complex mechanism involving red blood cells, fibrinogen, platelets, and other clotting factors.

Bloodstain:

A deposit of blood on a surface.

Bloodstain Pattern:

A grouping or distribution of bloodstains that indicates through regular or repetitive form, order, or arrangement the manner in which the pattern was deposited.

Bubble Ring:

An outline within a bloodstain resulting from air in the blood.

Cessation pattern

A bloodstain pattern resulting from blood drops released from an object due to its abrupt deceleration.

Directionality

The characteristic of a bloodstain that indicates the direction blood was moving at the time of deposition.

Directional Angle

The angle (gamma) between the long axis of a spatter stain and a defined reference line on the target.

Edge characteristic

A physical feature of the periphery of a bloodstain.

Forward spatter pattern

A bloodstain pattern resulting from blood drops which can be produced when a projectile creates an exit wound.

Insect Stain

A bloodstain resulting from insect activity.

Parent Stain

A bloodstain from which a satellite stain(s) originated.

Perimeter stain

An altered stain consisting of its edge characteristics, the central area having been partially or entirely removed.

Satellite Stain

A smaller bloodstain that originated during the formation of the parent stain as a result of blood impacting a surface.

Serum Stain

The stain resulting from the liquid portion of blood (serum) that separates during coagulation.

Spatter Stain

A bloodstain resulting from an airborne blood drop created when external force is applied to liquid blood.

Target

A surface onto which blood has been deposited.