

Supplementary Table S1

Abbreviations

ACSL1	Long-chain acyl-CoA synthase 1
RPPA	Revers Phase Protein Array
MDA	Malondialdehyde
GPX4	Glutathione peroxidase 4
PPI	Protein-protein interaction
HO-1	Heme Oxygenase 1
RCC	Renal cell carcinoma
KIRC	Kidney renal clear cell carcinoma
PPAR	Peroxisome proliferator-activated receptor
ROS	Reactive oxygen species
LIHC	Liver hepatocellular carcinoma
BRCA	Breast cancer
CHOL	Cholangio carcinoma
HNSC	Head and Neck squamous Cell Carcinoma
OS	Overall Survival
DFS	Disease free survival

Supplementary Table S2

Cell death pathway	morphological character	Key biochemical pathway
Apoptosis	Nuclear rupture, plasma membrane blistering, cell shrinkage, formation of apoptotic bodies and phagocytosis of adjacent cells	Members of the proapoptotic BCL2 family, activation of caspase, cleavage of hundreds of caspase substrates, exposure of phosphatidylserine, and production of MOMP and ROS.
Ferroptosis	Smaller mitochondria, reduced cristae, increased cell membrane density, mitochondrial membrane rupture, cell and normal	Intracellular iron accumulation, cysteine deprivation and glutathione peroxidase misfire eventually lead to lipid peroxidation.
Overall, while both cell apoptosis and ferroptosis can play a role in cancer development, they act through different mechanisms and pathways. Defects in apoptotic pathways can lead to the survival of damaged or abnormal cells, while excessive iron accumulation can promote the survival and proliferation of cancer cells.		

Supplementary Table S3

Diagnostic Methods	Advantages	Disadvantages
Immunohistochemistry (IHC)	High sensitivity: IHC can detect very low levels of protein, allowing for identification of low cancer cell counts and early-stage tumors. Selectivity: IHC can detect specific proteins, allowing for determination of cancer type and subtype. Visual: IHC results are visual, making them easy for doctors to diagnose and interpret.	Subjectivity: Interpretation of results may be subjective, such as color intensity and counting of positive cells. Requires controls: IHC requires control groups to correctly identify positive cells. May produce false positives: IHC may produce false positive results, especially when detecting small samples.
Western Blot	High selectivity: Western blotting can detect specific proteins, allowing for determination of cancer type and subtype. High sensitivity: Western blotting can detect very low levels of protein, allowing for identification of low cancer cell counts and early-stage tumors. Can detect multiple proteins simultaneously: Western blotting can detect multiple proteins at once, providing more comprehensive information.	Long processing time: Western blotting requires time to obtain results as it involves multiple steps including sample preparation, electrophoresis, transfer, and detection. Requires expertise: Western blotting requires expertise and skill for correct execution and interpretation of results. May produce false positives or negatives: Western blotting may produce false positive or negative results, especially when detecting small samples.